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EXECUTIVE SUMMARY

SANITATION FUND: STREET DAMAGE REIMBURSEMENT

By
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In 2003 the City of Kelso completed a street condition survey that revealed a serious street repair need. To address the issue a 13 year overlay plan was developed and adopted (exhibit A). The plan required an annual expenditure of $400,000 with the goal to keep all street Pavement Condition Index ratings (PCI) above 50. Full funding has not yet occurred, but progress is being made each year.

Within the City of Kelso there are five roadway classifications: Principal Arterials, Minor Arterials, Major Collectors, Minor Collectors, and Local Residential Roads.

The State Highway maintains the state routes (Principal Arterials) and only provides partial federal funding for other federal functionally classified routes. That excludes state funding opportunities for local residential streets. Therefore, Local residential Kelso streets are maintained with limited General Fund and Gas Tax revenues.

Residential local streets are the major concern of this analysis. The City began an audit of where the costs should be appropriately and legitimately appropriated. During a review of the main contributors of road wear, sanitation trucks were uniquely identified. Under RCW 43.09.210 it became clear that the city has a duty to transfer funds upon notice of the cost/damage attendant with garbage collection. Therefore, it became apparent that the sanitation fund must compensate the Street Fund for its obvious and quantifiable contribution to the street damage. RCW 43.09.210 states in pertinent part:

> Separate accounts shall be kept for each department, public improvement, undertaking, institution, and public service industry under the jurisdiction of every taxing body.

> All service rendered by, or property transferred from, one department, public improvement, undertaking, institution, or public service industry to another, ***shall be paid for at its true and full value by the department***, public improvement, undertaking, institution, or public service industry receiving the same, and no department, public improvement, undertaking, institution, or public service industry shall benefit in any financial manner whatever by an appropriation of fund made for the support of another.

Other significant uses in the heavy truck class using Kelso residential Local streets simply do not have a feasible, reasonable, frequent, consistent or established way to track or establish their activity within city limits on Local Residential streets. There is no other heavy class truck that would even come close to frequency and breadth of a sanitation truck use on residential streets.

Other equipment found in our motor pool, community transit and police are not classed "heavy trucks" with the exception of a fire ladder truck, which is rated at 60,000 GVW. Kelso has only one or two multi-story buildings in which a fire ladder truck would be dispatched. Additionally, weekly coverage of the entire city residential street network is not remotely approached by any other users.

The sanitation trucks used in Kelso have a gross weight of 60,000lbs (see exhibit B). A 60,000lb truck is classed a "heavy truck" which is the largest truck type allowed on the road (exhibit C). Road damage and wear increase very rapidly with the axle weight. In addition, the constant turning actions with residential use causes accelerated and accentuated wear. There is no controversy that garbage trucks have a significant contribution toward road wear. The question was how much.

Sanitation Truck Equivalency

Kelso first began a simple research for a correlation of street damage to sanitation trucks. We quickly found some existing data on the Internet that was well grouped in its conclusions. Using the average of four studies the city established equivalents of 1114 automobiles/one garbage truck. The Appendix 2E lists seven studies. The source is on www.co.ramsey/recovery/does/2E.pdf. This is Ramsey, Minnesota's, County website. The available data has been printed and is found in Exhibit D.

In order to further confirm and substantiate the data, we went to the Washington State Department of Transportation (WSDOT) Pavement Design Manual Module 4 Design Parameters (exhibit E). We then applied our garbage hauler, Waste Control, specific Truck information (exhibit B) to the provided formula. We used table 4.5 provided in Exhibit E and compared it to a fully loaded van, this resulted in one garbage truck equivalent to 1020 vehicles. This is very conservative since a fully loaded van weighs around 7000lbs and the average passenger vehicle is approximately 4000lbs. Also attached is Exhibit F providing an "in house" long hand calculation for a 5,000lb vehicle comparison, and a WSDOT calculation for a 4,000lb vehicle comparison. As you can see, we arrived at a ratio of 4730:1 and WSDOT concluded a 5100:1 equivalent ratio.

All of this information reveals conclusive evidence that using 1020 vehicles equivalent to one garbage truck is extra conservative, almost five times as conservative as the WSDOT calculation.

Kelso Local Street Average Daily Traffic

Of course the next step is to accurately determine the average daily traffic volume on our city's Local Residential Streets. The common recognized authority on trip generation is the Institute of Traffic Engineers. ITE's 2003 7th edition Trip Generation Volume 2 national Publication provides the following information.

Residential USA Average ADT Range

		(ADT/unit) x (Avg. # Dwelling Units)	Extrapolation
Single Family Detached	pg. 269	9.97 x 197	1885
Apartment	pg. 306	6.72 x 212	1425
Low-Rise Apartment	pg. 335	6.59 x 264	1740
Residential Condo/Townhouse	pg. 367	5.86 x 183	1072
Low-Rise Residential Condo/Townhouse	pg. 398	0.52 x 151	78.5
Mobile Home Park	pg. 415	4.99 x 188	938
Average Residential ADT			**1190**

Residential local streets are defined in the third edition of "Residential Streets" developed by the Urban Land Institute (ULI), The National Association of Home Builders (NAHB), The American Society of Civil Engineers (ASCE) and The Institute of Transportation Engineers (ITE). These professional organizations represent the major authorities in the industry. Table 2-1 on page 16 lists Local Streets at 400-1,500 average daily traffic (ADT), and detached single-family units producing 9.6 ADT/unit (exhibit G).

It is important to know what the local street use is in order to relate the cost of maintenance. Therefore, traffic counts were done in October 2006 through February 2007. The City was divided into a grid of six areas. At least two representative streets were selected for traffic counts in each area (see exhibit H). The Kelso Residential ADT for the study was 456. I have also provided a few samples of other Washington city's local street design standards (exhibit I) with comparative ADT's as follows.

- City of Kirkland
  Local Streets = < 1,500 ADT

- Pierce County
  Local Road Feeder = > 400-1,500 ADT

- City of Maple Valley
  Local neighborhood access = > 100 units max (~960ADT)
  9.6 ADT/unit as per ITE Manual

- City of Poulsbo
  Local access streets residential collector < 1,000 ADT

Calculation

To calculate the percentage of attributable traffic wear, we will be conservative in our approach. We will use the Local Residential Street Design standard average established in "Residential Streets" in table 2-1 on page 16 indicating a value of 400-1500 ADT (950 average), and average it with the actual Kelso residential ADT count of 456. Therefore, (950 + 456)/2 equals an average ADT of 703. *It is also noted that the Kelso Traffic count will be routinely verified to confirm it is still conservative.*

Further we will use 1020 vehicles = 1 Garbage Truck (exhibit E).

Therefore:
(703 ADT) x (7 days/week) = 4921 trips/week on the average for residential streets.

1020/4921 = 20.7% traffic effective loading Attributable to Sanitation Trucks.

Local Street Expenditures

The attributable cost of sanitation truck damage was originally thought to be appropriately placed wholly with the Arterial Street Fund because the Local Residential Street Overlay Program was placed in the Arterial Street Fund. However, the Arterial Street Fund has also historically been used to address a variety of projects not directly related to local residential streets. It is also noted that Arterial Streets are eligible for State Transportation Improvement Plan (STIP) Funding.

The next step is to determine how much will be or has been spent each year on local streets. To do this we will use the values from the two funds that affect local streets (Exhibit J). Funding for these funds do not radically change unless there is a grant funded project. I do not propose using grant funding in the reimbursement calculations.

Within the Arterial Street Fund (fund 102) there is only one constant item attributed to local streets. That item is the Overlay line. Occasionally this line item may include improvements for Federally Classified projects which, when funded by grant, must then be subtracted of out the local equation.

The local street fund is largely attributed to maintenance for all City streets. The exceptions are as follows:

Bars Line Item ELE-OBJ	$ 2007 Budgeted
30 – 470 (streets lights)	$ 80,000
30 – 482 (sidewalk)	$ 9,500
50 – 480 (bridge repairs)	$ 38,500
60 – All (Traffic Division items)	$ 197,685
90 – 420 (Traffic Division phone)	$ 700
90 – 430 (Traffic Division training)	$ 500
90 – 940 (Traffic Equipment reserve)	$ 10,882
00 – 002 (path & trails transfer)	$ 1,005
Total	**$ 338,712**

Conclusion

Actual reimbursement final transfers should be done based on actual expenditures for the year end. However, for budgeting purposes, the 2007 calculations are as follows.

$170,000 (arterial street overlay amount)
+$ 728,500 (street fund total)
- $338,712 (non-street use related items)
$559,788 (funds attributed to City street repairs)

$559,788 (funds attributed to City street repairs)
X 20.7 (% funds attributed to sanitation truck damage)

$115,876.12 for 2007 transfer attributed to sanitation truck damage

The recommended amount for the Sanitation Fund to compensate the Street Funds should therefore be budgeted at $115,876.00 for 2007. Again, the selections of proven but conservative input data result in a conservative sanitation contribution for proportionate damage and wear on Kelso local residential streets. In 2004 the Public Works Department also reorganized and created a significant savings in the Sanitation Fund. This reduction allowed for an equitable transfer without affecting a change in sanitation rates. Please also find attached the 2004 City attorney opinion on the transfer of sanitation funds to the street fund (exhibit K). Also please find a 2007 letter of engineering review by The Transpo Group, Inc., Transportation Specialists of Kirkland Washington. (Exhibit L)

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Sanitation Fund: Street Damage Reimbursement

Exhibit A – Original 13 Year Overlay Plan

Exhibit B – Waste Control E-Mail Response on Their Garbage Truck Loadings

Exhibit C – Heavy Truck Definition

Exhibit D – Minnesota Appendix 2E with Attached Studies

Exhibit E – Selected References from WSDOT Design Parameters Module 4

Exhibit F – Equivalent Single Axle Loads (ESAL's) Calculations using WSDOT Design Parameters

Exhibit G – Table 2-1 from "Residential Streets" pg 16 Developed by ULI, NAHB, ASCE, and ITE

Exhibit H – City of Kelso Local Residential Street Traffic Counts (w/summary)

Exhibit I – Selected Design Standards from the Jurisdictions of Kirkland, Pierce County, Maple Valley and Poulsbo

Exhibit J – Kelso Street Fund Budget History 2000-2007

Exhibit K – Kelso Attorney Opinion Regarding Solid Waste Fund Transfer to the Street Fund

Exhibit L – Transpo Engineers Review Letter

A

Original 13 year Overlay Plan

PROPOSED STREET OVERLAY PROGRAM
13 YEAR PLAN OVERVIEW

	PAVED AREA IN SQUARE YARDS
City Street Inventory	857,329
Streets Requiring Complete Reconstruction	19,066
2003 Overlay Program	7,999
2004 Overlay Program	131,406
Remaining Area to be Overlayed	698,858

OVERLAY @ $6.00 / SQUARE YARD	DOLLARS / YEAR	YARDS / YEAR	PERCENTAGE OF EXISTING STREETS	TIME TO COMPLETE IN YEARS
Current Budget	$100,000.00	16,667	1.94%	42
Proposed Budget	$400,000.00	66,667	7.78%	13

STREETS REQUIRING COMPLETE RECONSTRUCTION

	STREET	BEGINNING LOCATION	ENDING LOCATION	PCI	LENGTH	WIDTH	SF	TYPE	LANES	NOTES
292	ELIZABETH ST	ES of 8TH AVE S	WS of S 11TH AVE	0	769	25	19225	ACC	2	DESTROYED
443	WALNUT ST	ES of S 7TH AVE	PAVEMENT CHANGE	2	404	24	9696	ACC	2	
282	DIVISION ST	ES of N PACIFIC AVE	WS of 2ND AVE N	11	821	19	15599	ACC	2	ROAD HAS DIST
342	LEWIS ST	ES of ROSS AVE	WS of BOWMONT AVE	15	218	18	3924	ACC	2	30% OF THE ROAD LEFT
239	CHURCH ST	ES of N PACIFIC AVE	WS of 3RD AVE N	17	218	28	6104	ACC	2	50% DEPRESION
295	ELM ST	ES of 7TH AVE S	ES of 9TH AVE S	18	514	18	9252	BST	2	
34	21ST AVE N	DEAD END SOUTH	DEAD END NORTH	23	1060	18	19080	ACC	2	
76	4TH AVE N	NS of COWLITZ WAY	SS of CRAWRORD ST	23	222	33	7326	ACC	2	
303	GRADE ST	PAVEMENT CHANGE	CITY LIMITS	23	806	22	17732	CC/PC	2	STREET DESTROYED
350	LORD ST	ES of 8TH AVE N	DEAD END EAST	23	155	22	3410	BST	1	HIGH DIST/ DEST STREET
170	ALDER ST	ES of 3RD AVE S	WS of 4TH AVE S	24	220	22	4840	ACC	2	
367	N 6TH AVE	NS of HARRIS ST	SS of BLOYD ST	24	967	35	33845	BST	2	
450	YEW ST	ES of PACIFIC AVE	ES of S 6TH AVE	25	1078	20	21560	ACC	2	

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2005 OVERLAY PROGRAM
YEAR 1

	YEAR DONE	STREET	BEGINNING LOCATION	ENDING LOCATION	PCI	LENGTH	WIDTH	SF	TYPE	LANES
19		16TH AVE N	NS of CRAWFORD ST	SS of BURCHAM ST	82	1008	26	26208	BST	2
20		16TH PL	NS of BURCHAM ST	DEAD END NORTH	79	381	32	12192	PCC	2
21		17TH AVE N	NS of ALLEN ST	SS of CRWFORD ST	74	577	25	14425	BST	2
31		20TH AVE N	DEAD END SOUTH	SS of HARRIS ST	76	607	25	15175	BST	2
		21ST AVE N	DEAD END SOUTH	DEAD END NORTH		1016	22	22352		
175		ALLEN ST	ES of PAVEMENT CHANGE	ES of CRESCENT ST	78	2221	38	84398	BST	2
190		BARR DR	NS of ALLEN ST	NN of DEAD END NORTH	66	915	30	27450	BST	2
191		BATES RD	NS of ALLEN ST	SS of 18TH AVE N	67	1615	24	38760	BST	2
196		BLOYD ST	ES of KELSO DR	DEAD END EAST	90	382	25	9550	PCC	2
204		BURCHAM ST	ES of KELSO DR	WS of 18TH AVE N	59	1851	29	53679	BST	2
243		CHURCH ST	DEAD END WEST	WS of 17TH AVE N	63	192	17	3264	BST	2
244		CHURCH ST	ES of 17TH AVE N	DEAD END EAST	83	172	17	2924	BST	1
261		COWLITZ ST	DEAD END WEST	WS of 17TH AVE N	70	207	17	3519	BST	1
262		COWLITZ ST	DEAD END WEST	WS of N 17TH AVE	77	207	18	3726	BST	2
263		COWLITZ ST	ES of 17TH AVE N	DEAD END EAST	78	102	17	1734	BST	2
268		CRAWFORD ST	WS of 16TH AVE N	ES of N 17TH AVE	73	393	25	9825	BST	2
269		CRAWFORD ST	WS of N 17TH AVE	DEAD END EAST	83	272	16	4352	BST	2
297		EMERALD CT	NS of CEDAR FALLS	DEAD END NORTH	96	110	30	3300	ACC	2
299		FLORENCE AVE	ES of TERESA WAY	DEAD END EAST	80	200	24	4800	BST	2
302		GRADE ST	WS of KELSO ST	PAVEMENT CHANGE	83	202	24	4848	ACC	2
309		HARRIS ST	ES of 18TH AVE N	DEAD END EAST	81	968	25	24200	BST	2
332		KILTIE PL	NS of LORD ST	DEAD END NORTH	82	152	21	3192	ACC	2
352		LORD ST	DEAD END WEST	WS of 16TH AVEN	83	361	18	6498	ACC	2
353		LORD ST	ES of 16TH AVE N	DEAD END EAST	83	311	26	8086	ACC	2
359		MINOR RD	NS of MT BRYNION RD	DEAD END NORTH	62	2704	22	59488	BST	2
360		MT BRYNION RD	ES of KELSO DR	CITY LIMITS	55	520	38	19760	BST	2
362		N 13TH AVE	NS of SUNRISE ST	SS of MT BRYNION RD	79	224	18	4032	BST	2
363		N 13TH AVE	NS of MT BRYNION RD	DEAD END NORTH	96	403	26	10478	PCC	2
361		N 13TH AVE	NS of BLOYD ST	DEAD END NORTH		87	20	1740	GRAVE	1
364		N 19TH AVE	NS of ALLEN ST	SS of BATES RD	80	1000	20	20000	BST	2
366		N 23RD AVE	NS of ALLEN ST	SS of BURCHAM ST	51	1964	28	54992	ACC	2
427		SWANSON ST	ES of ALLEN ST	WS of 21ST AVE N	75	545	24	13080	BST	2
430		TERESA WAY	ES of MINOR RD	DEAD END NORTH	45	847	25	21175	BST	2

2005 OVERLAY PROGRAM
YEAR 1

YEAR DONE	STREET	BEGINNING LOCATION	ENDING LOCATION	PCI	LENGTH	WIDTH	SF	TYPE	LANES

TOTAL SQ. FT.	593202
TOTAL SQ. YD.	65911.33
Remaining Sq. Yd. at 66,667 SqYd/Yr	625.70

2006 OVERLAY PROGRAM
YEAR 2

	YEAR DONE	STREET	BEGINNING LOCATION	ENDING LOCATION	PCI	LENGTH	WIDTH	SF	TYPE	LANES
30		1ST AVE S	NS of PINE ST	TO BRIDGE	82	505	24	12120	ACC	2
29		1ST AVE S	SS of CEDAR ST	NS of PINE ST	83	1082	34	36788	ACC	2
67		3RD AVE S	NS of ASH ST	SS of OAK ST	65	741	32	23712	BST	2
66		3RD AVE S	SS of CEDAR ST	SS of ASH ST	80	832	24	19968	ACC	2
87		4TH AVE S	SS of VINE ST	NS of OAK ST	39	287	40	11480	ACC	2
86		4TH AVE S	NS of ASH ST	SS of VINE ST	51	477	28	13356	ACC	2
85		4TH AVE S	NS of CEDAR ST	SS of ASH ST	81	847	28	23716	PCC	2
88		4TH AVE S	NS of OAK ST	SS of ALLEN ST	98	226	40	9040	ACC	2
102		5TH AVE S	NS of ASH ST	WS of GRADE ST	62	674	24	16176	PCC	2
101		5TH AVE S	NS of CEDAR ST	SS of ASH ST	74	816	24	19584	PCC	2
116		6TH AVE S	NS of ALDER ST	SS of ASH ST	71	581	18	10458	BST	2
115		6TH AVE S	NS of CEDAR ST	NS of ALDER ST	82	326	24	7824	PCC	2
117		6TH AVE S	NS of ASH ST	SS of E PINEWAY ST	83	102	17	1734	BST	2
129		7TH AVE S	NS of CEDAR ST	DEAD END NORTH	59	258	16	4128	ACC	2
147		8TH AVE S	NS of CEDAR ST	DEAD END NORTH	74	336	19	6384	BST	2
158		9TH AVE S	NS of CEDAR ST	DEAD END NORTH	68	263	30	7890	ACC	2
168		ALDER ST	ES of 1ST AVE S	WS of S PACIFIC AVE	71	188	32	6016	ACC	2
169		ALDER ST	ES of S PACIFIC AVE	WS of 3RD AVE S	75	222	24	5328	ACC	2
172		ALDER ST	ES of 5TH AVE S	WS of 6TH AVE S	79	233	24	5592	PCC	2
171		ALDER ST	ES of 4TH AVE S	WS of 5TH AVE S	91	220	24	5280	PCC	2
180		ASH ST	ES of S PACIFIC AVE	WS of GRADE ST	99	1390	42	58380	ACC	2
179		ASH ST	ES of 1ST AVE S	WS of S PACIFIC AVE	100	137	38	5206	ACC	2
226		CEDAR ST	ES of 6TH AVE S	WS of 9TH AVE S	44	239	24	5736	ACC	2
227		CEDAR ST	WS of 9TH AVE S	WS of GRADE ST	74	534	33	17622	ACC	2
224		CEDAR ST	ES of 4TH AVE S	WS of 5TH AVE S	79	215	24	5160	PCC	2
225		CEDAR ST	WS of 5TH AVE S	WS of 6TH AVE S	82	213	24	5112	BST	2
222		CEDAR ST	ES of S PACIFIC AVE	WS of 3RD AVE S	86	213	24	5112	PCC	2
223		CEDAR ST	ES of 3RD AVE S	WS of 4TH AVE S	86	225	24	5400	PCC	2
221		CEDAR ST	ES of 1ST AVE S	WS of S PACIFIC AVE	100	180	29	5220	ACC	
259		COWEEMAN LN	GRADE ST	I-5 BRIDGE	73	926	18	16668	BST	2
289		E PINEWAY ST	ES of 5TH AVE S	WS of GRADE ST	66	480	16	7680	BST	1
308		HANCOCK ST	DEAD END SOUTH	SS of KINNEAR ST	83	122	12	1464	ACC	1
333		KINNEAR ST	COWEEMAN ST	DEAD END EAST	59	356	20	7120	BST	2
414		MAPLE ST	ES of S PACIFIC AVE	WS of 3RD AVE S	45	226	36	8136	ACC	2
413		MAPLE ST	ES of 1ST AVE S	WS of S PACIFIC AVE	63	135	36	4860	ACC	2
415		MAPLE ST	ES of 3RD AVE S	WS of 4TH AVE S	70	221	24	5304	PCC	2

2006 OVERLAY PROGRAM
YEAR 2

	YEAR DONE	STREET	BEGINNING LOCATION	ENDING LOCATION	RCI	LENGTH	WIDTH	SF	TYPE	LANES
418		MAPLE ST	ES of 6TH AVE S	DEAD END EAST	71	511	20	10220	BST	2
416		MAPLE ST	ES of 4TH AVE S	WS of 5TH AVE S	77	227	24	5448	PCC	2
417		MAPLE ST	ES of 5TH AVE S	WS of 6TH AVE S	81	213	26	5538	ACC	2
381		OAK ST	ES of GREAT ST	DEAD END EAST	44	370	31	11470	ACC	2
379		OAK ST	ES of S PACIFIC AVE	WS of 4TH AVE S	45	468	33	15444	BST	2
380		OAK ST	ES of 4TH AVE S	WS of 5TH AVE S	74	200	30	6000	ACC	3
387		PACIFIC AVE	NS of CEDAR ST	SS of BRIDGE MARKET	57	1684	42	70728	ACC	2
395		PINE ST	ES of 3RD AVE S	WS of 4TH AVE S	65	222	24	5328	ACC	2
394		PINE ST	ES of S PACIFIC AVE	WS of 3RD AVE S	67	217	30	6510	ACC	2
393		PINE ST	ES of 1ST AVE S	WS of S PACIFIC AVE	74	139	40	5560	ACC	2
396		PINE ST	ES of 4TH AVE S	WS of 5TH AVE S	77	224	24	5376	PCC	2
424		SUNRISE ST	ES of KELSO DR	DEAD END EAST	83	500	16	8000	BST	2
436		VINE ST	ES of 4TH AVE S	WA of 5TH AVE S	64	226	24	5424	PCC	2
435		VINE ST	ES of 3RD AVE S	WA of 4TH AVE S	73	225	22	4950	ACC	2
434		VINE ST	ES of S PACIFIC AVE	WS of 3RD AVE S	76	215	36	7740	ACC	2

TOTAL SQ. FT.	584490
TOTAL SQ. YD.	64943.33
Remaining Sq. Yd. at 66,667 SqYd/Yr	1593.70

2007 OVERLAY PROGRAM
YEAR 3

	YEAR DONE	STREET	BEGINNING LOCATION	ENDING LOCATION	PCI	LENGTH	WIDTH	SF	TYPE	LANES
6		10TH AVE S	DEAD END SOUTH	SS of ELM ST	53	454	22	9988	BST	2
5		10TH AVE S	NS of WALNUT ST	SS of YEW ST	77	450	24	10800	ACC	2
7		10TH AVE S	NS of ELM ST	SS of CHESTNUT ST	83	575	22	12650	ACC	2
14		11TH AVE S	CHESTNUT ST	MILL ST	74	821	23	18883	BST	2
11		11TH AVE S	NS of WALNUT ST	PAVEMENT CHANGE	78	477	24	11448	ACC	2
12		11TH AVE S	NS of PAVEMENT CHANG	SS of ELM ST	80	558	24	13392	BST	2
13		11TH AVE S	DEAD END SOUTH	SS of CHESTNUT ST	100	276	23	6348	ACC	2
18		12TH AVE S	NS of CHESTNUT ST	SS of MILL ST	76	887	20	17740	ACC	2
17		12TH AVE S	DEAD END SOUTH	SS of CHESTNUT ST	100	122	26	3172	ACC	2
123		7TH AVE S	NS of MILL ST	SS of CHERRY ST	67	276	22	6072	BST	2
128		7TH AVE S	NS of CHERRY ST	SS of CEDAR ST	72	275	22	6050	BST	2
126		7TH AVE S	SS of ELM ST	SS of CHESTNUT ST	80	453	18	8154	BST	2
127		7TH AVE S	SS of CHESTNUT ST	SS of MILL ST	82	583	30	17490	BST	2
125		7TH AVE S	SS of YEW ST	SS of ELM ST	83	915	18	16470	BST	2
124		7TH AVE S	NS of WALNUT ST	SS of YEW ST	99	511	22	11242	ACC	2
142		8TH AVE S	NS of WALNUT ST	SS of LAUREL ST	74	910	22	20020	BST	2
143		8TH AVE S	NS of LAUREL ST	DEAD END NORTH	77	260	22	5720	BST	2
146		8TH AVE S	NS of MILL ST	SS of CEDAR ST	81	476	22	10472	BST	2
145		8TH AVE S	NS of CHESTNUT ST	SS of MILL ST	82	622	22	13684	ACC	2
		8TH AVE S	SS of CHESTNUT ST	NS of ELM ST		438	15	6570		
157		9TH AVE S	DEAD END SOUTH	SS of CHESTNUT ST	34	188	21	3948	BST	2
155		9TH AVE S	NS of WALNUT ST	NS of YEW ST	59	550	24	13200	ACC	2
232		CHERRY ST	WS of 7TH AVE S	WS of 8TH AVE S	82	242	21	5082	ACC	2
237		CHESTNUT ST	ES of 7TH AVE S	WS of S 13TH AVE	79	1552	23	35696	BST	2
249		CLINTON ST	SS of CITY LIMITS	SS of WALNUT STREET	73	450	17	7650	BST	2
257		COWEEMAN LN	ES of S 11TH AVE	WS of 12TH AVE S	59	245	26	6370	ACC	2
256		COWEEMAN LN	ES of 8TH AVE S	WS of S 11TH AVE	74	776	16	12416	BST	2
258		COWEEMAN LN	ES of 12TH AVE S	DEAD END EAST	79	238	14	3332	BST	2
291		ELIZABETH ST	ES of 7TH AVE S	WS of 8TH AVE S	77	226	25	5650	ACC	2
		ELIZABETH ST	ES of 8TH AVE S	WS of S 11TH AVE		778	26	20228		
296		ELM ST	ES of 9TH AVE S	DEAD END EAST	65	757	20	15140	ACC	2
357		MILL ST	WS of S 7TH AVE	WS of GRADE ST	97	1493	33	49269	ACC	2
412		S 13TH AVE	NS of WALNUT ST	SS of GRADE ST	55	2235	32	71520	BST	3
411		S 13TH AVE	NS of HAZEL ST	NS of WALNUT STREET	65	1914	32	61248	BST	3
444		WALNUT ST	PAVEMENT CHANGE	PAVEMENT CHANGE	62	906	25	22650	ACC	2
445		WALNUT ST	PAVEMENT CHANGE	PAVEMENT CHANGE NEW AC	83	620	22	13640	BST	2

2007 OVERLAY PROGRAM
YEAR 3

	YEAR DONE	STREET	BEGINNING LOCATION	ENDING LOCATION	PCI	LENGTH	WIDTH	SF	TYPE	LANES
446		WALNUT ST	PAVEMENT CHANGE	WS of S 13TH AVE	100	350	28	9800	ACC	2
449		YEW ST	ES of 9TH AVE S	WS of S 11TH AVE	67	476	23	10948	ACC	2

TOTAL SQ. FT.	594152
TOTAL SQ. YD.	66016.89
Remaining Sq. Yd. at 66,667 SqYd/Yr	520.14

2008 OVERLAY PROGRAM
YEAR 4

	YEAR DONE	STREET	BEGINNING LOCATION	ENDING LOCATION	PCI	LENGTH	WIDTH	SF	TYPE	LANES
389		PACIFIC PL	ES of N PACIFIC AVE	WS of 1ST AVE N	43	355	16	5680	ACC	2
37		22ND AVE	SS of BLOYD ST	SS of SUNRISE ST	44	418	20	8360	ACC	2
38		23RD AVE	NS of BLOYD ST	SS of SUNRISE ST	50	455	16	7280	ACC	2
341		LEWIS ST	ES of N 4TH AVE	WS of ROSS AVE	51	214	18	3852	BST	2
326		HOME CT	NS of DIVISION ST	WS of 1ST AVE N	56	563	16	9008	ACC	1
365		N 19TH AVE	NS of BURCHAM ST	SS of BLOYD ST	59	397	20	7940	BST	2
32		20TH AVE N	DEAD END SOUTH	SS of BURCHAM ST	60	192	28	5376	BST	2
340		LEWIS ST	ES of N 2ND AVE	WS of N 3TH AVE	60	18	18	324	ACC	2
331		JONES RD	NS of 18TH AVE N	JONES CT	64	958	21	20118	ACC	2
39		24TH AVE N	DEAD END SOUTH	SS of BURCHAM ST	65	555	24	13320	PCC	2
33		20TH AVE N	NS of BURCHAM ST	SS of BLOYD ST	66	402	24	9648	BST	2
35		21ST AVE N	NS of BURCHAM ST	SS of BLOYD ST	67	405	24	9720	BST	2
203		BURCHAM ST	ES of 18TH AVE N	WS of N 20TH AVE	68	380	26	9880	BST	2
22		18TH AVE N	NS of BATES RD	SS of JONES RD	69	1050	28	29400	BST	2
36		22ND AVE	SS of BURCHAM ST	SS of BLOYD ST	72	293	25	7325	ACC	2
425		SUNRISE ST	ES of 18TH AVE N	WS of BEHSHEL HEIGHTS RD	72	1701	25	42525	BST	2
28		1ST AVE N	NS of DIVISION ST	SS of BARNES ST	73	1300	16	20800	BST	2
338		LEWIS ST	ES of 1ST AVE N	WS of N 2ND AVE	73	220	17	3740	ACC	2
406		ROSS AVE	NS of DIVISION ST	SS of BARNES ST	76	1337	19	25403	ACC	2
74		4TH AVE N	NS of CROY ST	SS of BARNES ST	77	1036	21	21756	ACC	2
194		BLOYD ST	ES of 18TH AVE N	WS of N 22ND AVE	77	1162	24	27888	BST	2
205		BURCHAM ST	WS of 18TH AVE N	PAVEMENT CHANGE	77	390	24	9360	ACC	2
339		LEWIS ST	ES of N 3TH AVE	WS of N 4TH AVE	78	18	18	324	ACC	2
195		BLOYD ST	ES of 22ND AVE	WS of SUNRISE ST	80	1235	24	29640	ACC	2
73		4TH AVE N	NS of DIVISION ST	SS of CROY ST	81	257	16	4112	ACC	2
216		BURCHAM ST	WS of N 22ND AVE	WS of SUNRISE ST	81	1282	24	30768	BST	2
40		24TH AVE N	NS of BLOYD ST	SS of SUNRISE ST	83	333	16	5328	ACC	2
189		BARNES ST	CITY LIMITS	BOWMONT AVE	83	1561	26	40586	PCC	2
280		CROY ST	ES of ROSS AVE	WS of BOWMONT AVE	83	211	21	4431	BST	2
423		SUNRISE CT	ES of 23RD AVE	WS of 24TH AVE	83	252	16	4032	ACC	2
200		BOWMONT AVE	NS of DIVISION ST	SS of BARNES ST	98	1337	29	38773	ACC	2
281		CROY ST	ES of BOWMONT	CITY POLICE	100	247	20	4940	ACC	2
329		JONES CT	ES of JONES RD	CITY LIMITS / DEAD END	100	429	12	5148	BST	1
330		JONES CT	JONES CT	DEAD END NORTH	100	243	12	2916	ACC	1
343		LEWIS ST	ES of BOWMONT AVE	DEAD END EAST	100	132	19	2508	ACC	2
		MINOR RD	NS of KELSO DR	SS of MT. BRYNION RD		2796	40	111840		

2008 OVERLAY PROGRAM
YEAR 4

	YEAR DONE	STREET	BEGINNING LOCATION	ENDING LOCATION	PCI	LENGTH	WIDTH	SF	TYPE	LANES

TOTAL SQ. FT.	584049
TOTAL SQ. YD.	64894.33
Remaining Sq. Yd. at 66,667 SqYd/Yr	1642.70

2009 OVERLAY PROGRAM
YEAR 5

	YEAR DONE	STREET	BEGINNING LOCATION	ENDING LOCATION	PCI	LENGTH	WIDTH	SF	TYPE	LANES
410		S 13TH AVE	NS of COLORADO ST	NS of HAZEL ST	46	1005	32	32160	BST	3
412		S 13TH AVE	NS of WALNUT ST	SS of GRADE ST	55	2235	32	71520	BST	3
187		BAKER WAY	ES of TALLEY WAY	ES of TALLEY WAY	59	1820	36	65520	PCC	2
390		PARROT WAY	WS of TALLEY WAY	SS of COLORADO WAY	60	3325	24	79800	BST	2
411		S 13TH AVE	NS of HAZEL ST	NS of WALNUT STREET	65	1914	32	61248	BST	3
248		CLINTON ST	SS of COLORADO ST	NS of CITY LIMITS	68	287	24	6888	ACC	2
428		TALLEY WAY	BRIDGE	COLLORADO ST	69	6339	26	164814	ACC	2
322		HAZEL ST	WS of CITY LIMITS	WS of S 13TH AVE	99	607	35	21245	ACC	2
260		COWEEMAN PARK D	NS of TENNANT WAY	DEAD END NORTH	99	1870	38	71060	ACC	3
		COLORADO ST	WS of CLINTON ST	NS of TALLEY WAY		1416	24	33984		

TOTAL SQ. FT.	608239
TOTAL SQ. YD.	67582.11
Remaining Sq. Yd. at 66,667 SqYd/Yr	-1045.08

2010 OVERLAY PROGRAM
YEAR 6

	YEAR DONE	STREET	BEGINNING LOCATION	ENDING LOCATION	PCI	LENGTH	WIDTH	SF	TYPE	LANES
387		PACIFIC AVE	NS of MILL ST	SS of CEDAR ST	57	892	42	37464	ACC	2
113		6TH AVE S	NS of CHESTNUT ST	SS of MILL ST	59	495	23	11385	BST	2
65		3RD AVE S	NS of MILL ST	SS of CEDAR ST	62	811	25	20275	ACC	2
386		PACIFIC AVE	NS of YEW ST	SS of MILL ST	63	1668	42	70056	ACC	2
335		LAUREL ST	ES of S PACIFIC AVE	WS of 4TH AVE S	64	488	20	9760	BST	2
234		CHESTNUT ST	ES of 3RD AVE S	WS of 4TH AVE	64	235	24	5640	PCC	2
236		CHESTNUT ST	ES of 5TH AVE S	WS of 7TH AVE	67	498	22	10956	BST	2
336		LAUREL ST	ES of 5TH AVE S	WS of 7TH AVE S	73	495	21	10395	BST	2
82		4TH AVE S	NS of LAUREL ST	SS of ELM ST	75	424	28	11872	PCC	2
98		5TH AVE S	NS of ELM	SS of MILL ST	75	780	21	16380	BST	2
63		3RD AVE S	NS of LAUREL ST	SS of ELM ST	76	443	25	11075	PCC	2
114		6TH AVE S	NS of MILL ST	SS of CHERRY ST	77	320	24	7680	BST	2
228		CHERRY ST	ES of 1ST AVE S	WS of S PACIFIC AVE	77	192	25	4800	BST	2
230		CHERRY ST	ES of 3RD AVE S	WS of 4TH AVE S	78	221	25	5525	PCC	2
100		5TH AVE S	NS of CHERRY ST	SS of CEDAR ST	79	264	23	6072	ACC	2
111		6TH AVE S	NS of LAUREL ST	SS of ELM ST	79	434	24	10416	PCC	2
231		CHERRY ST	ES of 4TH AVE S	WS of 5TH AVE S	79	225	24	5400	PCC	2
110		6TH AVE S	NS of YEW ST	SS of LAUREL ST	80	428	24	10272	PCC	2
235		CHESTNUT ST	ES of 4TH AVE S	WS of 5TH AVE	80	228	24	5472	PCC	2
83		4TH AVE S	NS of ELM ST	SS of CHESTNUT ST	81	431	28	12068	PCC	2
85		4TH AVE S	NS of MILL ST	SS of CEDAR ST	81	758	28	21224	PCC	2
84		4TH AVE S	NS of CHESTNUT ST	SS of MILL ST	82	360	28	10080	PCC	2
99		5TH AVE S	NS of MILL ST	SS of CHERRY ST	82	377	24	9048	ACC	2
232		CHERRY ST	WS of 5TH AVE S	WS of 7TH AVE S	82	534	21	11214	ACC	2
29		1ST AVE S	NS of MILL ST	SS of CEDAR ST	83	582	34	19788	ACC	2
356		MILL ST	ES of S PACIFIC AVE	WS of S 5TH AVE	83	752	24	18048	ACC	2
402		RIVER RD	SS of OLIVE ST	RR TRACKS	83	1902	22	41844	ACC	2
112		6TH AVE S	NS of ELM	SS of CHESTNUT ST	84	415	24	9960	PCC	2
229		CHERRY ST	ES of S PACIFIC AVE	WS of 3RD AVE S	87	211	24	5064	PCC	2
62		3RD AVE S	NS of YEW ST	SS of LAUREL ST	89	439	20	8780	ACC	2
64		3RD AVE S	NS of ELM ST	SS of MILL ST	96	750	25	18750	PCC	2
293		ELM ST	ES of PACIFIC AVE	WS of 5TH AVE S	97	740	24	17760	CC/PC	2
357		MILL ST	WS of S 5TH AVE	WS of S 7TH AVE	97	539	33	17787	ACC	2
233		CHESTNUT ST	ES of S PACIFIC AVE	WS of 3RD AVE S	100	216		0	ACC	2
294		ELM ST	ES of 5TH AVE S	WS of 7TH AVE S	100	488	24	11712	CC/PC	2
384		OLIVE ST	ES oF S RIVER RD	END OF STREET	100	365	26	9490	ST&AC	2

2010 OVERLAY PROGRAM
YEAR 6

	YEAR DONE	STREET	BEGINNING LOCATION	ENDING LOCATION	PCI	LENGTH	WIDTH	SF	TYPE	LANES
		6TH AVE S	NS of CHERRY ST	SS of CEDAR ST		291	24	6984		
		CHERRY ST	ES of 5TH AVE S	WS of 7TH AVE S		492	24	11808		
		YEW ST	ES of PACIFIC AVE	WS of 7TH AVE S		1256	22	27632		
356		MILL ST	RR TRACKS	ES of PACIFIC AVE S		237	24	5688	ACC	2
		RIVERSIDE DR	NS of RIVER RD	RR TRACKS		1771	18	31878		

TOTAL SQ. FT.	597502
TOTAL SQ. YD.	66389.11
Remaining Sq. Yd. at 66,667 SqYd/Yr	147.92

2011 OVERLAY PROGRAM
YEAR 7

	YEAR DONE	STREET	BEGINNING LOCATION	ENDING LOCATION	PCI	LENGTH	WIDTH	SF	TYPE	LANES
448		WOOD AVE	NS of DONATION ST	SS of REDPATH ST	27	733	19	13927	BST	2
165		ACADEMY ST	ES of N 4TH AVE	WS of 5TH AVE N	49	236	36	8496	BST	2
75		4TH AVE N	NS of ALLEN ST	SS of COWLITZ WAY	53	722	35	25270	ACC	3
287		DONATION ST	ES of 2ND AVE N	WS of PAVEMENT CHANGE	55	94	14	1316	ACC	2
23		1ST AVE N	NS of CHURCH ST	SS of CRAWFORD WAY	59	566	36	20376	PCC	2
51		3RD AVE N	NS of ALLEN ST	SS of ACADEMY ST	60	210	30	6300	ACC	1
164		ACADEMY ST	ES of N PACIFIC AVE	WS of N 4TH AVE	62	488	36	17568	ACC	2
238		CHURCH ST	ES of 1ST AVE N	WS of N PACIFIC AVE	65	207	36	7452	ACC	2
388		PACIFIC AVE	SS of BRIDGE MARKET	SS of COWLITZ WAY	69	835	38	31730	BST	2
313		HARRIS ST	ES of WOOD AVE	1ST AVE	73	107	19	2033	BST	1
43		2ND AVE N	NS of DONATION ST	SS of REDPATH ST	74	722	20	14440	ACC	2
44		2ND AVE N	NS of REDPATH ST	SS of CROY ST	74	725	20	14500	BST	2
270		CRAWFORD ST	ES of 1ST AVE N	WS of N PACIFIC AVE	76	222	40	8880	ACC	2
407		ROSS AVE	NS of REDPATH ST	SS of DIVISION ST	76	582	24	13968	BST	2
61		3RD AVE N UPPER	NS of ACADEMY ST	SS of COWLITZ WAY	77	480	24	11520	BST	1
310		HARRIS ST	ES of 1ST AVE N	WS of N PACIFIC AVE	77	231	22	5082	BST	2
163		ACADEMY ST	ES of 1ST AVE N	WS of N PACIFIC AVE	80	225	36	8100	ACC	2
60		3RD AVE N LOWER	NS of ACADEMY ST	SS of COWLITZ WAY	81	480	24	11520	BST	1
250		COLUMBIA ST	ES of 1ST AVE N	WS of N PACIFIC AVE	81	220	24	5280	BST	2
328		INEER ST	ES of N PACIFIC AVE	WS of 1ST AVE N	81	483	16	7728	ACC	2
26		1ST AVE N	NS of N PACIFIC AVE	SS of REDPATH ST	82	390	20	7800	ACC	2
283		DIVISION ST	ES of 2ND AVE N	WS of ROSS AVE	82	640	22	14080	ACC	2
286		DONATION ST	ES of 1ST AVE N	WS of N PACIFIC AVE	82	165	26	4290	BST	2
398		REDPATH ST	ES of N PACIFIC AVE	WS of KELSO AVE	82	1448	33	47784	BST	2
285		DONATION ST	ES of WOOD AVE	WS of 1ST AVE N	83	290	17	4930	BST	1
400		RIVER AVE	DEAD END SOUTH	SS of INNER ST	83	246	14	3444	ACC	2
57		3RD AVE N	NS of REDPATH ST	SS of DIVISION ST	87	594	22	13068	ACC	2
56		3RD AVE N	NS of DONATION ST	SS of REDPATH ST	91	735	22	16170	ACC	2
79		4TH AVE N	DEAD END SOUTH	N KELSO AVE DEAD END NOR	92	1117	19	21223	ACC	2
27		1ST AVE N	NS of REDPATH ST	SS of DIVISION ST	99	615	22	13530	ACC	2
55		3RD AVE N	BURCHAM	NS of DONATION ST	99	309	22	6798	ACC	2
80		4TH AVE N	WS of KELSO DR	SS of REDPATH ST	99	686	30	20580	ACC	2
210		BURCHAM ST	ES of KELSO AVE	WS of N 4TH AVE	99	228	21	4788	ACC	2
284		DIVISION ST	ES of ROSS AVE	ES of BOWMONT AVE	99	292	23	6716	ACC	2
288		DONATION ST	PAVEMENT CHANGE	WS of 4TH AVE N	99	424	23	9752	ACC	2
42		2ND AVE N	NS of N PACIFIC AVE	NS of DONATION ST	100	167	32	5344	ACC	2

2011 OVERLAY PROGRAM
YEAR 7

	YEAR DONE	STREET	BEGINNING LOCATION	ENDING LOCATION	PCI	LENGTH	WIDTH	SF	TYPE	LANES
207		BURCHAM ST	ES of WOOD AVE	WS of N 1ST AVE	100	240	18	4320	BST	
208		BURCHAM ST	ES of N 1ST AVE	WS of N PACIFIC AVE	100	268	20	5360	BST	
209		BURCHAM ST	ES of N PACIFIC AVE	WS of KELSO AVE	100	232	23	5336	BST	
240		CHURCH ST	ES of N 4TH AVE	WS of N 5TH AVE	100	210	32	6720	BST	2
		1ST AVE N	NS of CRAWFORD ST	SS of N PACIFIC AVE		1763	35	61705		
		1ST AVE N	SS of CHURCH ST	NS of ALLEN ST		518	28	14504		
		ALLEN ST	ES of N 1ST AVE	WS of N 3RD AVE		491	38	18658		
		DIVISION ST	WS of 2ND AVE N	ES of N PACIFIC AVE		823	19	15637		
		WOOD AVE	SS of DONATION ST	WS of N 1ST AVE		830	16	13280		

TOTAL SQ. FT.	581303
TOTAL SQ. YD.	64589.22
Remaining Sq. Yd. at 66,667 SqYd/Yr	1947.81

2012 OVERLAY PROGRAM
YEAR 8

	YEAR DONE	STREET	BEGINNING LOCATION	ENDING LOCATION	PCI	LENGTH	WIDTH	SF	TYPE	LANES
440		W HIGHLAND PARK D	DEAD END WEST	WS of PAVEMENT CHANGE	41	524	20	10480	BST	2
178		APPLE LN	ES of HAUSSLER RD	NN of N VISTA WAY	46	744	34	25296	BST	2
405		RONS CT	ES of HIGHLAND PARK DR	DEAD END EAST	49	453	31	14043	ACC	2
405		RONS CT	ES of HIGHLAND PARK DR	DEAD END EAST	49	453	31	14043	ACC	2
307		GRIM RD	SS of W HIGHLAND PARK	SS of GRIM RD	51	1226	32	39232	ACC	2
320		HAUSSLER RD	WS of W VISTA WAY	SS of APPLE LN	56	440	21	9240	BST	2
404		ROLEY COURT	ES of KELSO DR	DEAD END EAST	56	840	28	23520	PCC	2
318		HAUSSLER RD	ES of KELSO DR	APPLE LN	57	2800	26	72800	BST	2
391		PAXTON RD	ES of KELSO DR	DEAD END EAST	57	473	18	8514	BST	2
354		LOWRANE DR	DEAD END SOUTH	SS of HAUSSLER RD	60	700	18	12600	BST	1
319		HAUSSLER RD	DEAD END SOUTH	SS of W VISTA WAY	65	1118	20	22360	BST	2
442		W VISTA WAY	ES of HAUSSLER RD	WS of N VISTA WAY	67	954	20	19080	ACC	2
392		PAXTON RD	NS of PAXTON RD	DEAD END NORTH	69	450	18	8100	ACC	2
217		CARROLS ST	KELSO ST	CITY LIMITS	73	2245	23	51635	ACC	2
188		BANYON DR	SS of GRIMM RD	BLOCKED GATE.	77	2170	32	69440	ACC	2
374		N VISTA WAY	ES of N VISTA WAY	DEAD END EAST	81	1101	20	22020	ACC	2
385		OVERLOOK DR	NS of CARROLLS RD	DEAD END NORTH	82	383	19	7277	BST	2
278		CRIS RD	DEAD END SOUTH	SS of W VISTA WAY	83	405	12	4860	BST	1
324		HIGHLAND PARK DR	DEAD END SOUTH	SS of W HIGHLAND PARK DR	83	408	22	8976	BST	2
297		EMERALD CT	NS of CEDAR FALLS	DEAD END NORTH	96	110	30	3300	ACC	2
220		CEDAR FALLS DR	ES of KELSO DR	DEAD END EAST	98	1163	30	34890	ACC	2
334		KRYSTLE CT	NS of CEDAR FALLS	DEAD END NORTH	99	124	30	3720	ACC	2
201		BOWMONT AVE	NS of VEYS DR	N of CITY LIMITS	99	1369	32	43808	ACC	2
409		RUBY PL	NS of CEDAR FALLS	DEAD END NORTH	100	180	30	5400	ACC	2
421		SUNNYSIDE DR	DEAD END WEST	WS of HIGHLAND PARK DR	100	500	14	7000	BST	1
438		VISTA WAY	DEAD END SOUTH	SS of W VISTA WAY	100	1011	21	21231	ACC	1
323		HIGHLAND PARK DR	SS of RONS CT	SS of HAUSSLER RD				0		
		HIGHLAND PARK DR	NS of HAUSSLE RD	SS of W HIGHLAND PARK DR		1107	20	22140		
		W HIGHLAND PARK D	ES of PAVEMENT CHANGE	WS of HIGHLAND PARK DR		194	20	3880		

TOTAL SQ. FT.	588885
TOTAL SQ. YD.	65431.67
Remaining Sq. Yd.	

2012 OVERLAY PROGRAM
YEAR 8

	YEAR DONE	STREET	BEGINNING LOCATION	ENDING LOCATION	PCI	LENGTH	WIDTH	SF	TYPE	LANES
						at 66,667 SqYd/Yr		1105.36		

2013 OVERLAY PROGRAM
YEAR 9

	YEAR DONE	STREET	BEGINNING LOCATION	ENDING LOCATION	PCI	LENGTH	WIDTH	SF	TYPE	LANES
325		HOLLY ST	SS of COWLITZ WAY	WS of CLEARVIEW DR	43	506	15	7590	ACC	1
255		CORDUROY RD	NS of ALLEN ST	SS of HARRIS STREET RD	49	1413	21	29673	ACC	2
162		ACADEMY DR	ES of 9TH AVE N	SS of COWLITZ WAY	53	640	16	10240	BST	1
15		12TH AVE N	NS of COWLITZ WAY	NN of LORD ST	54	704	14	9856	ACC	2
173		ALLEN DR	NS of ALLEN ST	WS of CLEARVIEW DR	58	1404	16	22464	BST	1
267		COWLITZ WAY	ES of N 9TH AVE	DEAD END EAST	61	1011	16	16176	ACC	2
167		ACADEMY ST UPPER	ES of 5TH AVE N	WS of 9TH AVE N	66	959	16	15344	ACC	1
321		HAWTHORNE ST	ES of RIVER RD	END OF STREET	66	1170	22	25740	BST	2
138		7TH AVE SW	NS of CHURCH ST	SS of COWLITZ WAY	67	230	32	7360	BST	2
241		CHURCH ST	DEAD END WEST	WS of N 6TH AVE	67	173	28	4844	BST	2
151		9TH AVE N	WS of ACADEMY DR	SS of CHURCH ST	69	250	18	4500	ACC	1
177		ALLEN ST	WS of CORDUROY RD	ES of CITY LIMITS	71	673	24	16152	BST	2
425		SUNRISE ST	ES of BEHSHEL HEIGHTS	NS of BURCHAM ST	72	1187	25	29675	BST	2
152		9TH AVE N	SS of CHURCH ST	SS of COWLITZ WAY	72	245	22	5390	BST	2
276		CRESCENT DR N	NS of CRESCENT DR	DEAD END NORTH	74	494	18	8892	BST	2
176		ALLEN ST	ES of N 23RD AVE	WS of CORDUROY RD	74	1627	28	45556	PCC	2
139		8TH AVE N	NS of CHURCH ST	SS of COWLITZ WAY	75	230	30	6900	BST	2
247		CLEARVIEW DR	NS of ALLEN ST	SS of COWLITZ WAY	75	350	12	4200	ACC	1
277		CRESCENT RD	NS of ALLEN ST	DEAD END EAST	76	1688	22	37136	BST	2
166		ACADEMY ST LOWER	ES of 5TH AVE N	WS of 9TH AVE N	76	959	18	17262	ACC	1
175		ALLEN ST	ES of PAVEMENT CHANGE	ES of CRESCENT ST	78	2221	38	84398	BST	2
137		7TH AVE SW	DEAD END SOUTH	SS of CHURCH ST	78	129	32	4128	BST	2
266		COWLITZ WAY	WS of N 7TH AVE	ES of N 9TH AVE	81	470	56	26320	BST	2
419		STARDUST LN	DEAD END SOUTH	SS of SUNRISE ST	81	297	19	5643	BST	2
242		CHURCH ST	ES of N 6TH AVE	WS of 9TH AVE N	82	703	30	21090	BST	2
206		BURCHAM ST	PAVEMENT CHANGE	DEAD END EAST	82	380	24	9120	BST	2
368		N 6TH AVE	NS of ALLEN ST	SS of ACADEMY ST	83	221	25	5525	BST	2
369		N 6TH AVE	DEAD END SOUTH	SS of COWLITZ WAY	83	340	21	7140	BST	2
401		RIVER RD	CITY LIMITS	SS of OLIVE ST	83	1690	21	35490	ACC	2
265		COWLITZ WAY	WS of N 5TH AVE	ES of N 7TH AVE	90	530	56	29680	PCC	2
317		HARRIS ST	ES of CORDUROY RD	ES of CITY LIMITS	99	1267	27	34209	ACC	2
358		MILLER DR	NS of SUNRISE ST	NS of CITY LIMITS	100	203	24	4872	ACC	2

2013 OVERLAY PROGRAM
YEAR 9

	YEAR DONE	STREET	BEGINNING LOCATION	ENDING LOCATION	PCI	LENGTH	WIDTH	SF	TYPE	LANES

TOTAL SQ. FT.	592565
TOTAL SQ. YD.	65840.56
Remaining Sq. Yd. at 66,667 SqYd/Yr	696.47

2014 OVERLAY PROGRAM
YEAR 10

	YEAR DONE	STREET	BEGINNING LOCATION	ENDING LOCATION	PCI	LENGTH	WIDTH	SF	TYPE	LANES
4		10TH AVE N	NS of AYERS ST	SS of SUNNYSIDE ST	26	750	18	13500	BST	2
183		AYERS ST	ES of 6TH AVE N	WS of N 7TH AVE	31	216	34	7344	BST	2
348		LORD ST	ES of 5TH AVE N	WS of N 7TH AVE	46	476	20	9520	BST	2
272		CRAWFORD ST	ES of N 7TH AVE	WS of 8TH AVE N	47	215	33	7095	BST	2
53		3RD AVE N	NS of CRAWFORD ST	SS of COLUMBIA ST	49	229	24	5496	BST	2
2		10TH AVE N	WS of CRAWFORD ST	SS of COLUMBIA ST	50	202	18	3636	BST	2
25		1ST AVE N	NS of DONATION ST	SS of N PACIFIC AVE	50	240	33	7920	BST	2
78		4TH AVE N	NS of COLUMBIA ST	DEAD END NORTH	50	242	33	7986	ACC	2
213		BURCHAM ST	ES of 6TH AVE N	WS of N 7TH AVE	50	217	32	6944	BST	2
422		SUNNYSIDE ST	ES of 7TH AVE NW	WS of 10TH AVE S	50	381	20	7620	BST	2
130		7TH AVE N	NS of CRAWFORD	SS of BRYNION ST	53	1925	38	73150	BST	2
130		7TH AVE SW	NS of COWLITZ WAY	NS of CRAWFORD ST	53	263	38	9994	BST	2
95		5TH AVE N	NS of COLUMBIA ST	NN of LORD ST	55	240	28	6720	BST	2
3		10TH AVE N	NS of HARRIS ST	SS of AYERS ST	56	235	18	4230	BST	2
212		BURCHAM ST	ES of 5TH AVE	WS of 6TH AVE	58	230	32	7360	BST	2
214		BURCHAM ST	ES of N 7TH AVE	WS of 10TH AVE N	58	422	22	9284	BST	2
150		8TH AVE N	SS of LORD ST	SS of AYERS ST	59	530	20	10600	BST	2
198		BLOYD ST	ES of 6TH AVE N	WS of N 7TH AVE	59	234	34	7956	BST	2
199		BLOYD ST	ES of N 7TH AVE	WS of 10TH AVE N	59	422	34	14348	BST	2
24		1ST AVE N	NS of CRAWFORD ST	SS of BURCHAM ST	60	1327	33	43791	BST	2
215		BURCHAM ST	ES of 10TH AVE N	DEAD END EAST	60	216	20	4320	BST	2
314		HARRIS ST	ES of 6TH AVE S	WS of N 7TH AVE	60	214	21	4494	BST	2
94		5TH AVE N	NS of CRAWFORD ST	SS of COLUMBIA ST	61	222	28	6216	ACC	2
271		CRAWFORD ST	ES of N PACIFIC AVE	WS of N 7TH AVE	61	1255	33	41415	BST	2
274		CRAWFORD ST	ES of 9TH AVE N	WS of 10TH AVE N	62	275	19	5225	BST	2
370		N 6TH AVE	NS of COWLITZ WAY	SS of CRAWFORD ST	62	215	33	7095	ACC	2
202		BRYNION ST	NS of 7TH AVE N	of BRIDGE	64	444	42	18648	BST	2
93		5TH AVE N	NS of COWLITZ WAY	SS of CRAWFORD ST	65	217	33	7161	ACC	2
315		HARRIS ST	ES of N 7TH AVE	WS of 8TH AVE N	65	216	20	4320	BST	2
211		BURCHAM ST	DEAD END WEST	WS of N 5TH AVE	66	118	26	3068	BST	2
373		N 6TH AVE	HARIS ST	DEAD END NORTH	67	676	33	22308	BST	2
372		N 6TH AVE	NS of LORD ST	of HARIS ST	68	261	21	5481	BST	2
77		4TH AVE N	NS of CRAWFORD ST	SS of COLUMBIA ST	69	230	33	7590	ACC	2
371		N 6TH AVE	NS of COLUMBIA ST	SS of LORD ST	69	230	20	4600	BST	2
275		CRAWFORD ST	ES of 10TH AVE N	DEAD END EAST	70	120	12	1440	ACC	1
349		LORD ST	ES of N 7TH AVE	WS of 8TH AVE N	74	218	34	7412	BST	2

2014 OVERLAY PROGRAM
YEAR 10

	YEAR DONE	STREET	BEGINNING LOCATION	ENDING LOCATION	PCI	LENGTH	WIDTH	SF	TYPE	LANES
251		COLUMBIA ST	ES of N PACIFIC AVE	WS of N 7TH AVE	76	1267	24	30408	BST	2
153		9TH AVE N	NS of CRAWFORD	SS of COLUMBIA ST	79	221	25	5525	ACC	2
153		9TH AVE N	NS of COWLITZ WAY	NS of CRAWFORD ST	79	259	25	6475	ACC	2
273		CRAWFORD ST	ES of 8TH AVE N	WS of 9TH AVE N	80	213	33	7029	BST	2
141		8TH AVE N	NS of COLUMBIA ST	SS of LORD ST	82	227	35	7945	BST	2
140		8TH AVE N	NS of COWLITZ WAY	SS of COLUMBIA ST	82	495	35	17325	BST	2
206		BURCHAM ST	PAVEMENT CHANGE	DEAD END EAST	82	380	24	9120	BST	2
52		3RD AVE N	NS of COWLITZ WAY	SS of CRAWFORD ST	83	215	30	6450	BST	2
252		COLUMBIA ST	ES of N 7TH AVE	WS of 9TH AVE N	83	489	56	27384	BST	2
54		3RD AVE N	NS of COLUMBIA ST	SS of HARRIS ST	99	480	25	12000	ACC	2
312		HARRIS ST	ES of N 4TH AVE	DEAD END EAST	99	130	19	2470	ACC	2
197		BLOYD ST	DEAD END WEST	WS of 6TH AVE N	100	60	24	1440	BST	1
311		HARRIS ST	ES of 3RD AVE S	ES of 4TH AVE	100	238	25	5950	ACC	2
182		AYERS ST	DEAD END WEST	WS of 6TH AVE N		141	14	1974	GR/BST	1

TOTAL SQ. FT.	556782
TOTAL SQ. YD.	61864.67
Remaining Sq. Yd. at 66,667 SqYd/Yr	4672.36

2015 OVERLAY PROGRAM
YEAR 11

	YEAR DONE	STREET	BEGINNING LOCATION	ENDING LOCATION	PCI	LENGTH	WIDTH	SF	TYPE	LANES
136		7TH AVE SW	NS of CLARK ST	DEAD END NORTH	46	393	14	5502	BST	1
246		CLARK ST	WS of NW 7TH AVE	WS of LONG AVE	51	592	20	11840	BST	2
245		CLARK ST	WS of R R TRACKS	WS of NW 7TH AVE	59	337	18	6066	BST	2
134		7TH AVE SW	NS of W MAIN ST	SS of GRANT ST	61	262	25	6550	BST	2
408		ROYAL ST	ES of 7TH AVE NW	WS of 5TH AVE NW	62	446	30	13380	BST	2
105		5TH AVE SW	NS of CATLIN ST	SS of W MAIN ST	63	260	36	9360	ACC	2
378		NW 8TH AVE	NS of GRANT ST	SS of CLARK ST	64	266	24	6384	BST	2
344		LINCOLN ST	WS of CITY LIMITS	WS of SW 7TH AVE	65	330	30	9900	BST	2
377		NW 8TH AVE	NS of W MAIN ST	NS of GRANT ST	66	300	32	9600	ACC	2
47		2ND AVE SW	NS of LINCOLN ST	SS of CATLIN ST	67	261	30	7830	PCC	2
120		6TH AVE SW	NS of CATLIN ST	SS of W MAIN ST	67	246	30	7380	BST	2
219		CATLIN ST	ES of 1ST AVE SW	DEAD END EAST	67	160	30	4800	ACC	2
218		CATLIN ST	ES of WASHINGTON	WS of 1ST AVE SW	68	1688	40	67520	BST	2
119		6TH AVE SW	NS of LINCOLN ST	SS of CATLIN ST	70	266	22	5852	BST	2
298		FISHER CT	WS of NW 2ND AVE	SS of CITY LIMITS	70	434	26	11284	BST	2
50		2ND AVE SW	NS of GRANT ST	SS of FISHER CT	71	1078	28	30184	BST	2
306		GRANT ST	ES of NW 4TH AVE	WS of NW 1ST AVE	71	760	30	22800	BST	2
132		7TH AVE SW	NS of CATLIN ST	SS of W COWLITZ WAY	73	187	30	5610	BST	2
69		3RD AVE SW	NS of LINCOLN ST	SS of CALTIN ST	74	240	30	7200	BST	2
46		2ND AVE SW	NS of WASHINGTON ST	SS of LINCOLN ST	75	234	30	7020	BST	2
48		2ND AVE SW	NS of CATLIN ST	SS of W MAIN ST	76	240	30	7200	BST	2
72		3RD AVE SW	NS of GRANT ST	DEAD END NORTH SCHOOL G	77	610	22	13420	BST	2
92		4TH AVE SW	NS of W MAIN ST	SS of GRANT ST	77	262	38	9956	BST	2
304		GRANT ST	ES of 8TH AVE NW	WS of LONG AVE	77	500	31	15500	BST	2
90		4TH AVE SW	NS of LINCOLN ST	SS of CATLIN ST	78	266	22	5852	BST	2
135		7TH AVE SW	NS of GRANT ST	SS of CLARK ST	78	330	30	9900	BST	2
133		7TH AVE SW	NS of W CATLIN	SS of W MAIN ST	78	190	30	5700	BST	2
375		NW 5TH AVE	WS of LONG AVE	SS of CLARK ST	78	250	32	8000	BST	2
49		2ND AVE SW	NS of W MAIN ST	SS of GRANT ST	79	252	30	7560	BST	2
121		6TH AVE SW	NS of W MAIN ST	SS of W COWLITZ WAY	79	125	30	3750	BST	2
68		3RD AVE SW	NS of WASHINGTON ST	SS of LINCOLN ST	80	244	30	7320	BST	2
91		4TH AVE SW	NS of CATLIN ST	SS of W MAIN ST	80	250	38	9500	BST	2
122		6TH AVE SW	NS of W COWLITZ WAY	SS of ROYAL ST	81	154	24	3696	BST	2
118		6TH AVE SW	NS of WASHINGTON ST	SS of LINCOLN ST	82	246	22	5412	BST	2
89		4TH AVE SW	NS of WASHINGTON ST	SS of LINCOLN ST	83	244	22	5368	BST	2
103		5TH AVE SW	NS of WASHINGTON ST	SS of LINCOLN ST	83	272	35	9520	PCC	2

2015 OVERLAY PROGRAM
YEAR 11

	YEAR DONE	STREET	BEGINNING LOCATION	ENDING LOCATION	PCI	LENGTH	WIDTH	SF	TYPE	LANES
345		LINCOLN ST	WS of SW 7TH AVE	WS of SW 8TH AVE	83	175	29	5075	BST	2
70		3RD AVE SW	NS of CATLIN ST	SS of W MAIN ST	84	250	30	7500	BST	2
131		7TH AVE SW	NS of WASHINGTON ST	SS of CATLIN ST	85	545	36	19620	PCC	2
71		3RD AVE SW	NS of W MAIN ST	SS of GRANT ST	92	262	30	7860	BST	2
104		5TH AVE SW	NS of LINCOLN ST	SS of CATLIN ST	94	273	36	9828	PCC	2
447		WASHINGTON ST	WS of CITY LIMITS	WS of 1ST AVE	95	1822	35	63770	PCC	2
346		LINCOLN ST	WS of SW 8TH AVE	WS of SW 1ST AVE	96	1282	36	46152	PCC	2
376		NW 5TH AVE	WS of CLARK ST	CITY LIMITS	99	393	32	12576	ACC	2
305		GRANT ST	ES of W COWLITZ WAY	ES of NW 4TH AVE	100	180	30	5400	ACC	2
347		LONG AVE	ES of W COWLITZ WAY	CITY LIMITS	100	750	26	19500	ACC	2
441		W MAIN ST	WS of 8TH AVE SW	WS of W COWLITZ WAY	100	262	35	9170	ACC	2
327		INCH ST	of 3RD AVE	LONG ST			20	0	GRAVE	1

TOTAL SQ. FT.	590167
TOTAL SQ. YD.	65574.11
Remaining Sq. Yd. at 66,667 SqYd/Yr	962.92

2016 OVERLAY PROGRAM
YEAR 12

	YEAR DONE	STREET	BEGINNING LOCATION	ENDING LOCATION	PCI	LENGTH	WIDTH	SF	TYPE	LANES
149		8TH AVE S	NS of VINE ST	SS of ALLEN ST	29	560	31	17360	BST	2
148		8TH AVE S	NS of ASH ST	SS of VINE ST	45	293	31	9083	ACC	2
192		BEHSHEL HEIGHTS R	NS of SUNRISE ST	SS of PAVEMENT CHANGE	57	1380	25	34500	ACC	2
10		10TH AVE S	NS of OAK ST	DEAD END NORTH	61	200	14	2800	ACC	2
301		GRADE ST	NS of MANASCO ST	SS of OAK ST	70	3136	45	141120	ACC	4
8		10TH AVE S	NS of ASH ST	SS of OAK ST	74	318	18	5724	BST	2
160		9TH AVE S	NS of VINE ST	SS of OAK ST	74	270	30	8100	BST	2
159		9TH AVE S	NS of ASH ST	SS of VINE ST	75	246	30	7380	BST	2
437		VINE ST	ES of GRADE ST	WS of 10TH AVE S	81	1083	30	32490	BST	2
382		OAK ST	ES of 8TH AVE S	ES of 10TH AVE S	81	500	29	14500	BST	2
181		ASH ST	ES of GRADE ST	ES of 10TH AVE S	82	670	33	22110	BST	2
290		EDINBURGH CT	NS of HARRIS STREET RD	DEAD END EAST	99	1108	30	33240	ACC	2
300		GLENMORE ST	ES of EDINBURGH CT	DEAD END EAST	99	446	30	13380	ACC	2
403		ROBERT CT	DEAD END SOUTH	WS of EDINBURGH CT	99	418	30	12540	ACC	2
429		TARA CT	NS of BEHSHEL HEIGHTS	DEAD END NORTH	99	1201	30	36030	ACC	2
193		BEHSHEL HEIGHTS R	SS of PAVEMENT CHANGE	DEAD END EAST	99	925	30	27750	ACC	2
429		TARA CT	NS of BEHSHEL HEIGHTS	DEAD END NORTH	99	1201	30	36030	ACC	2
397		PREIS CT	DEAD END WEST	WS of TARA ST	100	371	30	11130	ACC	2
431		TRAVIS ST	DEAD END WEST	WS of TARA ST	100	206	30	6180	ACC	2
432		TRAVIS ST	ES of TARA ST	DEAD END EAST	100	213	30	6390	ACC	2
433		TWEED CT	ES of EDINBURGH CT	DEAD END EAST	100	402	30	12060	ACC	2
397		PREIS CT	DEAD END WEST	WS of TARA ST	100	371	30	11130	ACC	2
431		TRAVIS ST	DEAD END WEST	WS of TARA ST	100	206	30	6180	ACC	2
432		TRAVIS ST	ES of TARA ST	DEAD END EAST	100	213	30	6390	ACC	2
355		MANASCO	ES of GRADE ST	WS of I-5		1008	26	26208	BST	2
		MANASCO	WS of I-5	ES of KELSO DR		999	26	25974		
161		9TH AVE S	NS of OAK ST	DEAD END NORTH		150	20	3000	GRAVE	1

TOTAL SQ. FT.	568779
TOTAL SQ. YD.	63197.67
Remaining Sq. Yd. at 66,667 SqYd/Yr	3339.36

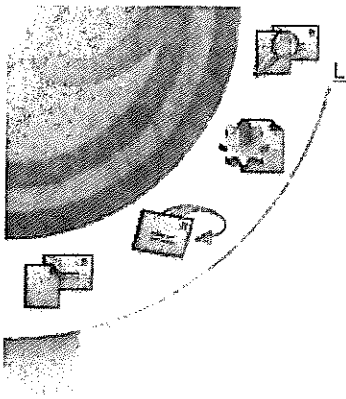
2017 OVERLAY PROGRAM
YEAR 13

	YEAR DONE	STREET	BEGINNING LOCATION	ENDING LOCATION	PCI	LENGTH	WIDTH	SF	TYPE	LANES
		PACIFIC AVE. N	NS of COWLITZ WAY	3RD AVE. N.		669	40	26760		
		PACIFIC AVE. N	NS of 3RD AVE. N.	CITY LIMITS		4084	20	81680		
		3RD AVE. N.	PACIFIC AVE. N.	NS of BURCHAM ST.		995	40	39800		
		N. KELSO AVE.	NS of BURCHAM ST	I-5		2544	40	101760		
		KELSO DR.	COWEEMAN RIVER BRID	PAVEMENT WIDENING		1669	45	75105		
		KELSO DR.	PAVEMENT WIDENING	ALLEN ST		809	57	46113		
		GRADE ST	MANASCO	COWEEMAN RIVER BRIDGE		201	40	8040		
		GRADE ST	COWEEMAN RIVER BRID	I-5		730	40	29200		
		GRADE ST	I-5	KELSO DR		374	40	14960		

TOTAL SQ. FT.	423418
TOTAL SQ. YD.	47046.44
Remaining Sq. Yd. at 66,667 SqYd/Yr	19490.59

B

Waste Control E-Mail Response on Their Garbage Truck Loadings



From: 'Rick Ensign' <riensign@wcrecycling.com> **Sent:** Mon Jul 10 12:45

To: 'Dean Amaral' <damaral@kelso.gov> **Priority:** Normal

Subject: Route Trucks **Type:** Embeded HTML/Text

Reply
Reply All
Forward
Delete
Address Book
Print
Block Sender
View Headers
Next
Previous

Dean

We operate Peterbuilt 3 axle garbage collection trucks in Kelso

Front Axle	18,000
Back Axle	34,000
Additional overweight permit	8,000

Total Gross weight 60,000

We average between 55,000 and 58,000 pounds per full load to landfill.

Rick Ensign
Waste Control

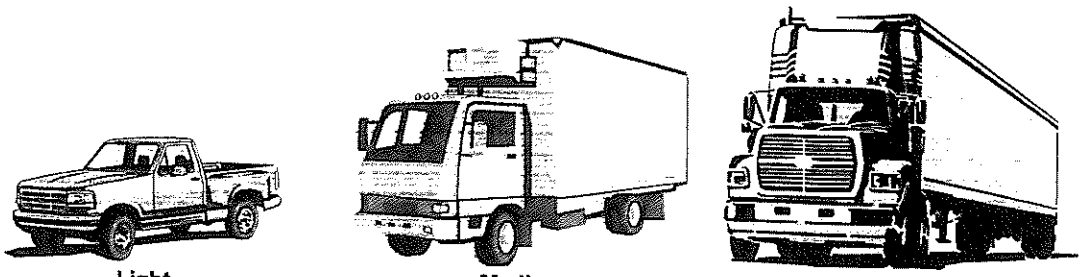
Folders User Profile Logoff

C

Heavy Truck Definition

Truck Categories

Trucks can be divided up into any number of different categories or classes. The most general truck classification is probably by gross weight. For instance, a family sports utility vehicle or 3/4 ton pickup is drastically different than a delivery van or an interstate tractor-semi trailer. Thus, one common practice is to classifying trucks and buses by gross vehicle weight rating. The three most common categories are shown in Figure 2.



Light
(pickup trucks, vans, SUVs)

Medium
(delivery trucks)

Heavy
(tractor-trailer combinations)

Figure 2: Common Truck Categories

Vehicle manufacturers use more precise technical definitions and divide trucks into eight classes according to gross vehicle weight rating (GVWR). Table 1 shows vehicle manufacturer truck classifications. Figure 3 shows a basic breakdown of the truck and bus population in the U.S.

Table 1: Vehicle Manufacturer Truck Classification[1]

Category	Class	GVWR[2]	Representative Vehicles
Light	1	0 - 27 kN 0 - 6,000 lbs.	pickup trucks, ambulances, parcel delivery
	2	27 - 45 kN (6,001 - 10,000 lbs.)	
	3	45 - 62 kN (10,001 - 14,000 lbs.)	
Medium	4	62 - 71 kN (14,001 - 16,000 lbs.)	city cargo van, beverage delivery truck, wrecker, school bus
	5	71 - 87 kN (16,001 - 19,500 lbs.)	
	6	87 - 116 kN (19,501 - 26,000 lbs.)	
	7	116 - 147 kN (26,001 to 33,000 lbs.)	
Heavy	8	147 kN and over (33,000 lbs. and over)	truck tractor, concrete mixer, dump truck, fire truck, city transit bus

Notes:

1. The above classes are not the same as used by the FHWA
2. Gross Vehicle Weight Rating (GVWR): weight specified by manufacturer as the maximum loaded weight (truck plus cargo) of a single vehicle

Trucks must often pay higher taxes than other road vehicles, and are subject to extensive regulation. Amongst factors affecting this: trucks are bigger and heavier than most other vehicles, and cause more wear and tear per hour on roadways; and trucks and their drivers are on the road for more hours per day. UPS vehicles are called 'package cars' in the US, because that exempted them from certain tax-rates. Rules on use taxes differ among jurisdictions.

Most jurisdictions have rules for commercial vehicles, regulating how many hours a driver may be on the clock, how much rest and sleep time is required (e.g., 11hrs on/10hrs off, and 60hrs off over every 7 days), and many other rules. Violations are often subject to significant penalties. Instruments to track each driver's hours must often be fitted.

Trucks are subject to noise emission requirements (emanating from the U.S. Noise Control Act) in order to protect the public from noise health effects, since trucks contribute disproportionately to roadway noise due to elevated stacks and intense tire and aerodynamic noise characteristics.

The Bridge Law deals with the relation between the gross weight of the truck and the amount of axles and the spacing between axles wheel base the truck has. Each State determines the minimum and maximum permissible weight per axle.

Types of trucks by size

Light trucks

Light trucks are car-sized (in the US, no more than 6,300 kg (13,000 lb)) and are used by individuals and commercial entities alike. In the UK they may not mass more than 3,500kg. They are comprised of:

- Pickup trucks
- Full-size vans
- Minivans
- SUVs

A logging truck

Medium trucks

Medium (or medium-duty) trucks are bigger than light but smaller than heavy trucks. In the US, they are defined as weighing between 6,300 kg (13,000 lb) and 15,000 kg (33,000 lb). For the UK the cut-off is 7.5 tonnes. Local delivery and public service (dump trucks, garbage trucks) are normally around this size.

Heavy trucks

Heavy trucks are the largest trucks allowed on the road. They are mostly used for long-haul purposes, often in semi-trailer configuration.

Road damage and wear increase very rapidly with the axle weight (truck weight divided by the number of axles). In many countries with good roads a 6-axle truck may have a maximum weight over 50 tonnes (50,000 kg).

In Australia many trailers are linked to make what are called road trains.

D

Minnesota Appendix 2E With Attached Studies

CITY OF CHANHASSEN

ORGANIZED COLLECTION STUDY

FINAL REPORT

September, 1993

Resource Strategies Corporation

Appendix 2E
Truck Traffic Issues

Among the comments heard during the public engagement work were complaints related to truck traffic. These stem form concerns about the number of garbage trucks in an alley or on a street during a week, and the reasons for concern included noise, wear and tear on streets, safety, and pollution.

The following data were gathered on the issue of garbage trucks and traffic. References cited are at the end of the summary.

Reduced wear and tear on streets

- Reduction of road impacts of overweight vehicles, especially during spring road restrictions when roads are the most vulnerable to damage as the frost moves out of the ground.
  - "As they fill up on the route, many refuse collection vehicles operate overweight, especially during the spring months when waste generation rates increase but road weight limits may be at their lowest…Further, the number of overweight vehicles using roadways increases the potential for paving damage." (GBB, pg V-2)
  - "The damage that garbage trucks inflict on City streets is magnified in the spring when road restrictions typically restrict other trucks from using the same streets." (Bonestroo)
  - "During the road restriction period, most refuse vehicles exceed the allowable axle load limits. Because of the variable nature of refuse, these vehicles are rated by volume capacity rather than by weight. Minnesota is said to have some of the lowest allowable load limits when road restrictions are in effect; therefore refuse vehicle manufacturers are not inclined to design vehicles to meet Minnesota standards. Haulers generally acknowledge in some cases when road restrictions are in effect, their fully loaded vehicles exceed the allowable load limits. Tertiary (tag) axles and duel wheels are available on some refuse vehicles of more recent design, but they are not generally used in this area. Although these auxiliaries reduce the load on a road, they do not guarantee compliance with road restrictions….Mn/DOT will issue special permits to haulers who apply for such permits. These permits increase the allowable limit by 2,000 pounds/axle. Certain communities that enforce road restrictions may grant exemptions to refuse trucks operating on their residential streets. This practice is most common in cities with organized collection." (Roseville, pg 21)
  - "The number of exceptions to weight limits has direct bearing on the potential for damage to pavement. An increase in the frequency of overweight vehicles increases the risk of damage." (Chanhassen, pg 22)

- Reduction of relative impact on local streets of collection vehicles
  - "According to research conducted as part of the City of Chanhassen Organized Collection Study, MSW collection vehicles have road impacts

equivalent to 1,125 automobiles. Recycling vehicles represent the same impact as 525 automobiles." (GBB, pg V-2)

- Residential use of a typical cul-de-sac may generate 700-1,400 vehicle trips. A single hauler serving the cul-de-sac exceeds the weekly residential usage with an equivalent of 1,650 automobile trips. Five haulers serving the cul-de-sac in one week create the impact of 8,250 automobiles."
  - Minor residential street: 4,200-7,000 trips/week; five haulers 8,250
  - Local residential collector 7,000-21,000; five haulers 8,250
  - City collector street (MSA 9 ton roadway), 21,000-70,000 trips/wk
  - The pattern is clear. With exception of the MSA streets, solid waste collection vehicles currently serving the City create a significant portion of the relative impact of vehicles on local streets. "(Chanhassen, pg 21) [Note: presumably they are assuming each hauler does both MSW and recycling]
- "In general, garbage trucks are the heaviest vehicles that regularly use City streets. The impact that one garbage truck has on a City street equates to roughly 830 cars." (Bonestroo)
- "The expected life of any street or alley surface is related to the traffic which is carried by the street or alley. The roadway surface is particularly affected by heavy wheel loads. The effect on a roadway of one refuse truck is equivalent to 1,500 automobiles. This document has been documented by the Research Section of Mn/DOT and is currently used by Mn/DOT in street and highway design." (Metro Council)
- "Garbage collection vehicles are perceived to be very destructive to the roads, especially in the neighborhoods. Yet, there are only estimates of an equal number of car loads for every run of a garbage vehicle. We have not been able to find data which would reflect a "real" monetary savings to the community by the elimination of competitive haulers through organized collection. The weight of the vehicle which results in a negative impact to the road surface is based on the weight per sq. inch of wheel base that meets the road surface. Today all haulers are using third axle or flotation tires which would lessen the impact of weight per sq. inch of wheel base meeting the road surface." (Maplewood haulers' draft proposal, 1996)
- Haulers serving Maplewood in 1996 offered an alternative plan, which included: a) city would require haulers to use third axles or flotation tires on their equipment to reduce roadway wear and tear, and b) routing to be cognizant of load-sensitive streets, so that trucks are as empty as possible when service accounts on them
- Haulers in Roseville commented: "the number of trucks/vehicles on a street is not the cause of wear and tear on the streets; vehicle weight is the determining factor." (Roseville, pg 17)
- Soils: "The cost of constructing and maintaining roadways is generally higher in Chanhassen than in some communities, due to the clay soils prevalent in the community. Protecting the integrity of the local street network may, correspondingly, be a higher priority in Chanhassen than in other communities." (Chanhassen, pg iii)

- Champlin implemented organized collection in 1987 in conjunction with installation of sewers and new streets throughout the City; organized collection was implemented to reduce street wear from the start (per JoAnne Brown, City staff)
- Pavement design manuals give load factor values to vehicle typed
  - Car load factor - .0007
  - Truck 18,000 lb/axle – 1.0 load factor
  - Garbage truck can be as high as 1.6 load factor

Another equivalency that design engineers use is 1 garbage truck trip = 1,000 car trips in terms of damage to pavement. Residential streets have average daily traffic counts of 200 – 500 vehicles. (Roseville Public Works 2001)

Bonestroo = Memo to Rick Getschow, City Administrator, Lauderdale, from Paul Heuer, Bonestroo Rosene Anderlik & Associates, Engineers & Architects, 4/9/01

Chanhassen = City of Chanhassen Organized Collection Study, Final Report, 9/93, Resource Strategies Corporation

GBB = Comparative Economic Analysis of MSW and Recycling Collection in the Twin Cities Metropolitan Area, prepared for Metro Council by GBB, 9/94; data from late summer through fall, 1993

Metro Council = Study of Organized Collection in the Twin Cities Metropolitan Area, 1985

Roseville = Options for Residential Waste Collection and Recycling for Roseville, a report to the Roseville City Council, prepared by Roseville's Citizen Advisory Committee for Residential Solid Waste Management, 4/91

Roseville Public Works 2001 = Impact of Heavy Trucks on Low Residential Streets, presented by Duane Schwartz, Roseville Public Works Director, 10/11/01 to Roseville Solid Waste Commission.

Saint Paul = An Integrated Solid Waste Management System for the City of Saint Paul (1990)

IV. STREET IMPACTS

A lot of discussion has been held on the impacts of overweight vehicles on roadways. This is of particular concern to the City of Chanhassen, due to the nature of the clay soils, generally present in the community. The soil conditions require stricter road construction design requirements, which result in higher initial construction costs and higher maintenance costs.

The MnDOT Road Design Manual establishes criteria and factors for comparing relative impacts to roadways by various vehicle types. The "Sigma N-18 value" can be utilized to determine cumulative damage effects of vehicles during the design life of pavement. Vehicles are classified in a scale of one to ten. Automobiles are Type 1, trucks with trailers and buses are Type 10, typical MSW vehicles are Type 5 and typical recycling vehicles are Type 4.

The N18 factors indicate that a single Type 5 vehicle (MSW vehicle) has the relative cumulative effect on pavement as 1,125 automobiles. Recycling vehicles have the same damage effect as 525 automobiles. Other comparisons include large pickups (17.5 autos), buses (850 autos) and 5-axle semi-tractor trailers (1,475 autos). These factors are based upon an assumed distribution of the various vehicle types on local, rural and county state aid roadways: autos (75.7%), pickups and other vehicles under 1 ton (16.0%), MSW and other single unit vehicles (1.7%), recycling and other single unit vehicles (2.6%), and trucks with trailers and buses (1.0%).

The combined impact of an MSW vehicle and a recycling vehicle on a local road is equivalent to 1,650 automobiles. Residential use of a typical cul de sac may generate 100-200 average daily traffic (ADT). Weekly traffic equates to 700-1,400 vehicle trips. A single hauler serving the cul de sac exceeds the weekly residential usage with an equivalent of

1,650 automobile trips. Five haulers serving the cul de sac in one week create the impact of 8,250 automobiles.

A minor residential through street may generate 600-1,000 ADT, or 4,200-7,000 trips per week. A single hauler generates the equivalent of 1,650 trips with weekly service. Five haulers create the impact of 8,250 trips in one week.

A local residential collector street may generate 1,000-3,000 ADT, or 7,000-21,000 weekly trips. A single hauler generates the equivalent of 1,650 trips per week; whereas, five haulers generate 8,250 trips. A City collector street (MSA 9 ton roadway) may generate 3,000-10,000 ADT, or 21,000-70,000 trips per week.

The pattern is clear. With exception of the MSA streets, solid waste collection vehicles currently serving the City create a significant portion of the relative impact of vehicles on local streets. The lower the ADT of a particular street, the higher the potential impact by solid waste collection vehicles.

There are 128 miles of roadway in the City of Chanhassen. Of these, 96 miles are under City jurisdiction. The majority of City streets are designed as 7 ton roadways. Twenty percent, or 19 miles, are municipal state aid (MSA) roadways, which are a 9 ton design. A few miles of older streets are categorized as 5 ton roadways.

During spring weight restriction (generally a 10 week period), 9 ton roads are posted 7 ton, 7 ton roads are posted 5 ton and the 5 ton roads are posted 4 ton. The tonnages relate to the gross weight (loaded weight) of a vehicle, distributed on each axle. For example, a 40,000 lb. gross weight (GW) triple axle vehicle has a distributed weight of 6.7 tons per axle (40,000/2,000 = 20 tons/3 = 6.7 tons).

The larger solid waste collection vehicles used in Chanhassen range from 39,000 GW to 44,000 GW. A triple axle 44,000 GW vehicle would have a weight of 7.33 tons per axle; whereas, a double axle 39,000 GW vehicle would have a weight of 9.75 tons per axle. Neither vehicle can meet reduced weight restrictions and the latter exceeds weight limits on all City streets throughout the entire year.

The number of exceptions to weight limits has direct bearing on the potential for damage to pavement. An increase in the frequency of overweight vehicles increases the risk of damage. Alternative collection methods can reduce the number and frequency of vehicles exceeding weight limits and reduce the cumulative damage effect on local roadways.

STUDY OF ORGANIZED REFUSE COLLECTION
in the
Twin Cities Metropolitan Area

See Page 20
Par. 2+3

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ABOUT THIS STUDY

This study fulfills the legislative requirement that the Metropolitan Council prepare a study on the need for a system to implement organized collection of residential, commercial and industrial refuse in the region. Organized collection, as defined by the Council in its Solid Waste Management Development Guide/Policy Plan, means a solid waste collection system wherein overlap of collection service areas and types of collection services is prevented or controlled. The organizing body may be public or private and may exert its control by directly providing the collection service or contracting for collection services. This definition of organized collection covers all of the potential methods available for organizing collection services.

The Council established a task force to help it prepare the organized collection study. The task force met over a period of two months reviewing the collected data and preliminary draft of the study. Task force members were selected to assure that county, municipal and business concerns were addressed in the study.

The data used in the study were obtained from a number of sources including municipal ordinances and licenses, refuse collection companies operating in the region and national, county and other reports and studies. Some of the data, particularly price information, will become dated quickly given the nature of the market and industry.

The study has five sections. The first section identifies the questions the study will ask in its attempt to determine whether a system is needed to implement organized collection in the region. The second section describes how refuse collection services are currently delivered in the region. The third section evaluates the need for organized collection. The fourth section identifies the liabilities and disadvantages of organized collection. The final section provides the reader with the study's findings and conclusions. The appendix contains a listing of all known refuse collection companies operating in the region.

INTRODUCTION

In 1984, the state legislature amended the Waste Management Act (WMA) to require the Metropolitan Council to conduct a study on the way refuse is collected in the Metropolitan Area. Specifically, the Council is to "study the need for a system to implement organized collection of residential, commercial and industrial solid waste in the Metropolitan Area."

Organized collection refers to the manner in which refuse is collected from the waste generator. Organized collection means a solid waste collection system wherein overlap of collection service areas and types of collection services is prevented or controlled. The organizing body may be public or private, and may exert its control by directly providing the collection service or contracting for collection services. Organized collection does not mean that refuse collection is mandatory or that the county or city will direct where the waste will be delivered or that a public agency will necessarily perform the collection service.

The different methods to organize refuse collection are contract, franchise, municipal or other private arrangement. The contract method is where a municipality contracts with one service provider to collect refuse in a specific area and the city pays the contractor for the service. The franchise method is where the city permits one service provider to collect refuse in a specific area and establishes the price but the service provider retains responsibility for collection of the service fee. Municipal collection is where the city provides the service with public employees. Private arrangements include neighborhood groups contracting with a refuse collector for the service or several refuse collectors forming a new company in order to organize their collection routes.

Currently few areas or municipalities in the region have organized collection of residential solid waste. Fewer still have organized collection of commercial and industrial wastes. As a rule, most waste generators arrange directly with a waste hauler for refuse collection services. Questions have been raised about this type of arrangement for refuse collection and whether improvements can be made to the collection system with implementation of organized collection.

To determine the need for a system to implement organized collection in the Metropolitan Area, this study will ask four questions. First, can organized collection improve productivity and reduce collection costs? This study will evaluate the costs of refuse collection under several different market arrangements. And if there are cost savings to the household or business with an organized collection system, the study will attempt to identify where those cost savings are achieved.

Second, can organized collection reduce environmental impacts in the neighborhood and improve public safety? This study will evaluate to what extent organized collection reduces air pollution, fuel consumption, wear and tear on city streets and county and state roads, litter complaints, rodent harborages and vehicle accidents involving refuse collection trucks.

Third, can organized collection facilitate implementation of the Council's Solid Waste Management Development Guide/Policy Plan? This study will explore what organized collection can do to reach the objectives for abatement programs and obtain information about waste generation reduction or recovery.

Fourth, can organized collection integrate or enhance existing county and local authorities for waste management? The study will evaluate whether organized collection can replace or complement waste designation. Waste designation is the same as flow control.

These issues will be discussed to better understand what organized collection can and cannot do for improving waste management in the region. They will also help to determine whether there is a need for a systematic process to organize refuse collection services in the region. The report will begin with an evaluation of the existing collection system. This evaluation will serve as the basis for comparison with organized collection systems and with the findings of other national and local studies that have evaluated refuse collection systems and costs. The study will also discuss the liabilities and disadvantages associated with organized collection.

The final chapter contains the conclusions regarding organized collection of refuse. The appendix contains a comprehensive list of the refuse collection companies licensed by municipalities in the region.

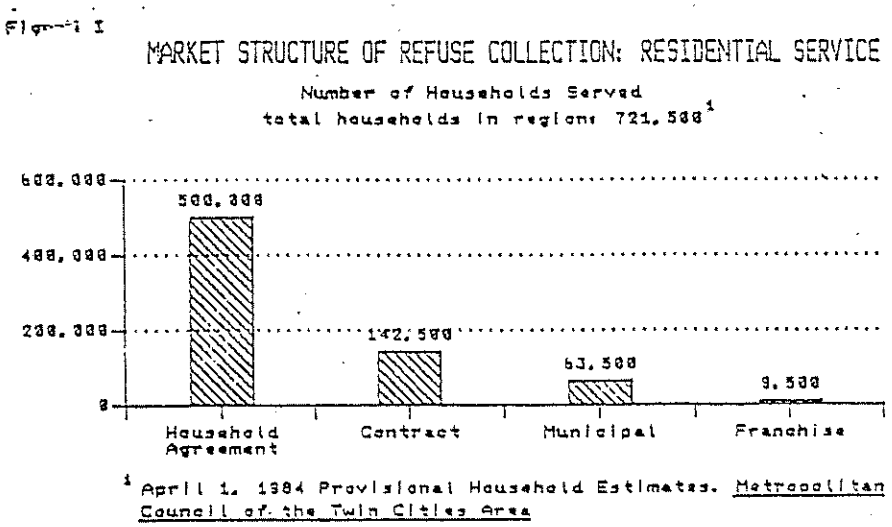
DESCRIPTION OF THE EXISTING COLLECTION SYSTEM

INTRODUCTION

The refuse collection industry in the Twin Cities Metropolitan Area is quite unlike the industry as it exists in most other major metropolitan areas. Most metropolitan areas have fewer, generally larger refuse collection firms servicing the region, or rely extensively upon municipal collection.

In regards to residential refuse collection, the Metropolitan Area uses three different methods or structures for ensuring refuse is collected. The predominant method that is used is where each household by itself arranges for refuse collection services. The household verbal arrangement system serves approximately 500,000 households, or 69 percent of the region (see Figures 1 and 2). The role of the municipality is limited and typically requires a household to remove wastes at least once a week from the property. Some municipalities have mandatory collection which means that the household must hire a collection firm to provide the service. Enforcement occurs on an as needed basis.

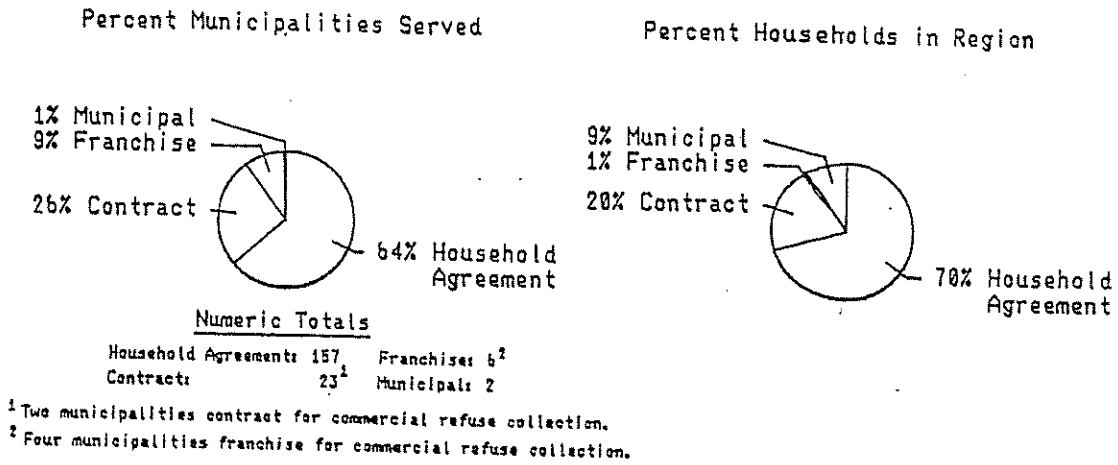
FIGURE 1



[1] April 1, 1984 Provisional Household Estimates. Metropolitan Council of the Twin Cities Area

FIGURE 2

MARKET STRUCTURE OF REFUSE COLLECTION: RESIDENTIAL SERVICE



Numeric Totals

Household Agreements: 157 Franchises: 6[2]
Contracts: 23[1] Municipals: 2

[1] Two municipalities contract for commercial refuse collection.
[2] Four municipalities franchise for commercial refuse collection.

The second largest method for provision of refuse collection services is where a city contracts or franchises with one company for collection services. There are 23 cities that contract for refuse collection services with a private firm and six cities that franchise or license one collector. The only difference between contract and franchise collection is the method of billing for the services. Under a contract the city is responsible for billing whereas the waste hauler is responsible for billing under the franchise arrangement. Of the municipalities that have contracts, 21 are competitively bid and two are negotiated. Of the cities with franchises, one is competitively bid, and five are negotiated. Cities that have contract collection serve about 145,000 or 20 percent of all the households in the region. Cities with franchises serve about 9,000 or one percent of the households.

The method which serves the least number of households, 62,000 or nine percent of the region's households, is for the city to provide for refuse collection services itself. Only two municipalities in the region currently provide for municipal collection of refuse, the cities of Minneapolis and Farmington. Minneapolis provides collection services to half of the city or about 62,000 households and Farmington provides collection services to about 1,500 households.

In regards to commercial and industrial refuse collection, waste generators typically arrange for collection service on their own with a waste hauler. Four of the municipalities that have franchise arrangements for residential collection also franchise for commercial refuse collection. Two municipalities that have contracts for collection also provide for commercial refuse collection in the contract. All of these municipalities are relatively small, consequently, the commercial refuse collection system is less organized than residential collection.

Less is known about the manner in which industrial wastes are collected than for residential and commercial collection. Because no city provides for industrial collection, it appears that industrial waste generators rely completely on arrangements between themselves and waste haulers for refuse collection.

REGULATORY REQUIREMENTS

Most cities license refuse collectors operating within their jurisdiction; however, towns are less likely to license collectors. The purpose of licensing is to ensure that collectors operating within the city are reputable business operators and carry the appropriate personal injury, accident and property damage insurance. Based upon information received from municipalities, Table 1 highlights the number of refuse collection companies that operate within a given municipality and their license fees and insurance requirements. Where information was available, the table indicates the number of collection firms collecting from the residential and commercial sectors.

Refuse collection companies must comply with other transportation regulations. Generally, these focus upon the vehicles operated by the company and include requirements on the size, weight and safe operations. By far most waste haulers complain about the weight restrictions in the springtime. They are often subject to fines because it is frequently impossible to operate a packer and comply with the weight restrictions. Transfer stations would reduce total vehicle mileage and may permit collectors to use smaller trucks and remain competitive. Currently, many haulers use very large packer trucks because they are more efficient if they must travel a great distance to the landfill.

PROFILE OF THE REFUSE COLLECTION INDUSTRY

In the Twin Cities the industry can be characterized as very decentralized, with concentration of companies at the small end of the spectrum. Information obtained from listings of municipal licenses indicates there are at least 225 refuse collection firms in the region. A listing of all known refuse collection companies operating in the region is included in the appendix. Most of these collectors have less than four refuse collection vehicles. Figures 3 and 4 provide a breakdown of company size by number of collection vehicles. Although the breakdown is imperfect because the Council was not able to obtain information from all of the collection companies, it provides a good perspective of the make up of the industry. Several firms are very large and can be characterized by the considerable investment of capital in equipment such as packer trucks, debris boxes, roll-offs or other containers.

The data shows that companies with more than 40 trucks make up two percent of the total number of firms in the refuse collection business. Though the international firms collect residential, commercial and industrial wastes, other large local firms compete with these companies for collection of waste from the commercial and industrial sectors.

Table 1
SELECTED MUNICIPAL AND TOWNSHIP LICENSING REQUIREMENTS FOR REFUSE COLLECTORS[1]

Municipality	No. of Haulers Licensed R	C	Total	Licensing Fees Base	Per Truck	Proposed Rates	Equipment List	Disposal Location	Manner of Disposal	Collection Schedule	Auto Insurance ($ x 1000) Personal	Accident	Property	Performance Bond
Afton			1	25										
Apple Valley	6	3	9	30	20		X	X	X	X	100	30		
Arden Hills			8	50		X	X	X	X					
Birchwood			1	6										
Bloomington				28	12	X	X			X	100	300	50	1000
Brooklyn Center	8	14	22	25	15		X				100	300	50	
Brooklyn Park	11	11	22			X	X	X	X	X	100	300	25	
Carver														
Chanhassen			8	25	15	X	X	X	X	X	100	300	25	1000
Chaska					50		X	X	X	X	50	100	25	
Circle Pines			2		25		X				100	300		
Cologne														
Coon Rapids				25	15		X	X	X		50	100	10	3000
Cottage Grove	5	2	7	54			X	X	X		100	300	100	
Crystal			22	27.50	16.50		X	X	X	X	100	300	50	
Champlin		10	14			X	X							
Eagan														
East Bethel			7	25										
Eden Prairie	9	2	11	30	15	X	X	X	X	X	100	300		1000
Edina	5	9	14	50	30	X	X	X	X	X	100	300	25	
											100	300	50	
Falcon Heights			12	25	15		X			X	50	100	25	1000
Forest Lake			2	25		X	X	X	X	X	100	300	50	2000
Fridley	8		17	60	15	X	X	X	X	X	100	300	50	
Golden Valley			20			X	X	X	X	X	100	300	50	
Hastings			1	10			X	X	X	X	100	300		
Hilltop														
Hugo														
Inver Grove Hgts.			16	25	3		X	X	X		100	300		
Lake Elmo			5	25						X	100	300		1000
Lakeland			2	25							100	300		3000
Lakeville			9	35			X	X	X	X	100	300	25	
Lauderdale			8	65	25		X	X		X	100	300	25	1000
Lexington			7	50			X	X	X	X	100	300	50	3000
Lino Lakes														
Little Canada			4	25			X	X	X	X	100	300		3000
Maple Grove			24			X	X	X	X	X	100	300		
Maplewood				60			X	X	X	X	100	300	50	3000
Mendota Heights			10	25	15						100	300		
Minnetonka	12	12	24	33	16	X	X	X	X	X	100	300	50	1000
Minnetrista			3	30	5	X	X	X	X		100	300		

Table 1 (cont.)
SELECTED MUNICIPAL AND TOWNSHIP LICENSING REQUIREMENTS FOR REFUSE COLLECTORS[1]

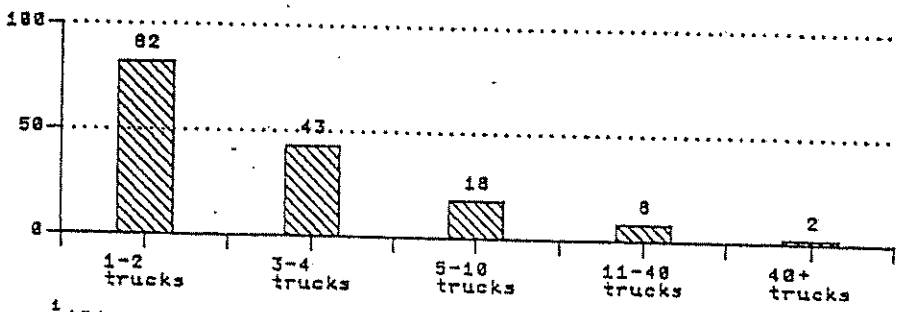
Municipality	No. of Haulers Licensed R	C	Total	Licensing Fees Base	Per Truck	Proposed Rates	Equipment List	Disposal Location	Manner of Disposal	Collection Schedule	Auto Insurance ($ x 1000) Personal	Accident	Property	Performance Bond
Mound			5	100		X	X	X	X	X	100	300	25	1000
Mounds View			5	50			X	X	X	X	250	500	50	1000
New Brighton			13	25			X	X	X	X	100	300		
New Hope			7	32	12.50	X	X				250	500	100	
Newport			8		25						100	300		
North St. Paul			10	50			X	X	X	X	100	300	100	3000
Oakdale			12	50			X	X	X	X	100	300	50	1000
Orono			6	30		X	X	X	X	X	100	300	50	1000
Plymouth	12	5	17	50	15		X	X	X	X	100	300		1000
Prior Lake														
Ramsey			4	25	15		X				100	300	50	
Richfield			15	118	29	X	X	X	X	X	100	300	25	1000
Rockford			7											
Rogers														
Rosemount				25			X	X	X	X	100	300		
Roseville			34	100			X	X	X	X	50		10	
St. Anthony			4	100			X	X	X	X	100	300		
St. Francis			3		50		X	X	X	X	100	300	50	
St. Paul			72	118.50		X	X				100	300	50	
St. Paul Park			5	25							100	300	50	
Savage			8	100	25	X	X	X	X	X	100	300		
Shoreview			11	50		X	X	X	X	X	100	300		
South St. Paul			14	50	5		X	X	X	X	25	50	5	100
Spring Lake Park			6	25	10						100	300		
Spring Park			5	25	10	X	X			X	100	300	25	1000
Vadnais Heights			10		40		X	X	X		100		25	3000
Victoria														
Waconia			2	100							100	300	50	
Watertown														
West St. Paul	12	13	25		50	X	X				100	300	50	
Woodbury			14	12		X	X	X	X	X	50	300	50	

1. Includes only those items specifically stated in licensing documents for residential, commercial and industrial haulers. (Please note that information on some communities has not yet been received.)

2. R includes firms servicing both residential and commercial collections.

FIGURE 3

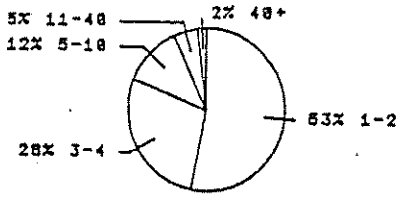
SIZE OF METROPOLITAN RESIDENTIAL, COMMERCIAL AND INDUSTRIAL REFUSE COLLECTION COMPANIES[1] BY NUMBER OF COLLECTION VEHICLES



[1] 154 responses out of 195 haulers contacted. (total number of regional haulers is approximately 215.) Please note that various different collection vehicles are used with a wide range of capacities. Also many of the smaller firms work on a part time basis.

FIGURE 4

PERCENT METROPOLITAN RESIDENTIAL, COMMERCIAL AND INDUSTRIAL REFUSE COLLECTION COMPANIES[1] BY NUMBER OF COLLECTION VEHICLES



[1] 154 responses out of 195 haulers contacted. (total number of regional haulers is approximately 215.) Please note that various different collection vehicles are used with a wide range of capacities. Also many of the smaller firms work on a part time basis.

It should be noted that in recent years there has been an increase in the number of local companies that have been acquired by the international companies, especially those local firms that have a significant percentage of their business collecting commercial wastes.

About 79 percent of the companies have four trucks or less and their business appears to be concentrated in the residential collection business. However, many of these firms do collect from commercial waste generators. The small firms appear to compete effectively in this market only if the commercial stops are near their other accounts and are not significant waste generators. Specialized equipment is needed to handle wastes from large commercial waste generators.

SERVICE LEVELS AND GEOGRAPHIC AREAS

There does not appear to be any difference in the type or levels of services offered by most of the refuse collection firms under either of the three methods for the provision of collection services. In general, residential refuse collection occurs once a week. For commercial and industrial waste generators, refuse is picked up on a more frequent schedule or as needed.

The collection of large, bulky items such as white goods, furniture, etc. will vary depending upon the market structure. For example, in Minneapolis the contract specifies that everything a homeowner puts out for pick up will be collected, even large, bulky items. Usually, under the household arrangement, households are limited to two or three 30-gallon cans. Bulky items cost extra, although leaves and other yard wastes are usually collected provided it is properly packaged for collection. Many cities with contracts generally provide for spring and fall clean up days to manage leaves, brush and bulky items.

Some cities may require special types of pickup services for senior citizens. These arrangements are often specified in the contract where a municipality contracts for the collection services. It is not unheard of that collectors operating under the household agreement market arrangement will provide cost differentials to senior citizens.

A significant percentage of large household goods are handled through other collection service providers such as Goodwill, Salvation Army or American Council for the Blind. In essence these organizations provide for recycling and capture of significant quantities of white goods, textiles, furniture, shoes and a myriad of household items.

A number of the smaller refuse collectors focus upon particular waste streams. It is difficult to quantify but it appears that some haulers work on a part-time basis and collect, possibly salvage, and dispose of demolition wastes, construction materials and other items. In our conversations with the collectors, the Council found that some collectors who handle residential wastes are part-time too. These collectors work primarily in the evenings or Saturdays in addition to their regular job. A small number of collectors are primarily in other business such

as landscaping, and collect refuse on the side. It is difficult to quantify the percentage of collectors who operate in the refuse collection business on a part-time basis.

Most collection companies operating under the household contract arrangement try to keep their business within a certain geographic area, for example the Midway area of St. Paul, or North St. Paul, Maplewood and parts of Roseville. It is to a collectors advantage to keep travel time at a minimum for efficiency. In some cases there may be five to 10 companies operating in a particular neighborhood. As can be seen in Table 1, some municipalities have up to 12 different companies operating in the city collecting residential refuse. A similar situation exists for collection of commercial wastes.

Most haulers under any of the service arrangements provide good service to their customers or at least satisfy the expectations of their customers for refuse removal (out of sight, out of mind). Local surveys indicate that most people are satisfied with refuse collection services. So do national studies which show that everyone is satisfied with refuse collection a tribute to the industry.

EVALUATION OF NEED FOR ORGANIZED COLLECTION

CAN ORGANIZED COLLECTION IMPROVE PRODUCTIVITY AND REDUCE COLLECTION COSTS?

Collectors use a variety of ways to establish a price for waste disposal. The costs of refuse collection and disposal may depend on the type of material; its location in relation to the landfill and on the collector's route; the size of the collection crew; frequency of pick-up; the type and size of container the refuse is in; the need for any special collection equipment; and whether the pick up is curb-side, alley or walk-up, and the pricing of competitors.

Prices for commercial and industrial waste collection vary. Based on information taken from license applications from the City of St. Paul, commercial rates vary from $23 per month for weekly pick-up from a one cubic yard container to $220 per month for a 40 cubic yard container. Table 2 identifies the range of prices for collection of commercial wastes within the City of St. Paul.

Table 2
COMMERCIAL REFUSE COLLECTION CHARGES IN THE CITY OF ST. PAUL, 1985*
MONTHLY CHARGES FOR WEEKLY PICK UP

Cubic Yard Capacity of Containers	Rate Range Low	High
0.5	$ 30.00	
1.0	23.00 -	37.00
1.5	22.50 -	40.00
2.0	27.50 -	46.00
3.0	32.00 -	42.00
4.0	40.00 -	50.00
6.0	60.00 -	65.00
8.0	75.00	
10.0	100.00	
15.0	125.00 -	150.00
20.0	140.00 -	170.00
25.0	150.00	
30.0	170.00 -	200.00
40.0	190.00 -	220.00

*Source: Licensing applications for refuse haulers in the city of St. Paul, Minn. 1985.

For residential waste generators, the price for collection services depends upon many factors including the market structure for delivery of services, the type of service (alley, curb or walk-in) and level of

service (bulky items, recycling service). Table 3 shows the differences in costs to the household as a consequence of the different market structures, that is, household verbal agreements, franchise, contract or municipal. For those households where the municipality contracts for waste collection, total costs to the household (TCHS) averages $6.03 per month. TCHS with a franchise arrangement averages $7.03 per month. Where an individual household arranges with a waste hauler for refuse collection, the TCHS averages $8.21 per month. Under the municipal collection arrangement in Minneapolis, the TCHS averages $7.02 per month whereas the TCHS for municipal collection in Farmington is $8.67 per month. These costs are averages and do not reflect differences in the type of services provided for or whether the service is curb-side, alley or walk-in.

It should be understood that all households will pay for refuse collection when the city contracts for refuse collection. Under the system where each household arranges for refuse collection services, only those households desiring the service will pay and oftentimes two or more households will double up on one account. Some haulers estimate that about 10 percent of the households in the St. Paul area do this.

Table 3
MONTHLY SINGLE-FAMILY DWELLING
RESIDENTIAL REFUSE COLLECTION CHARGES[1]

Market Structure	Mean Monthly Charge	Mean Monthly Seniors/Disabled Charge
Household agreement[2]	$8.21	$5.57
Franchise[2]	7.03	4.44
Contract[3,4]	6.03	3.64
Municipal:		
Farmington[2]	8.67	N/A
Minneapolis[4]	7.02	N/A

[1]Mean monthly base rate for weekly collection of a 60-gallon refuse contain (or the equivalent) curbside.

[2]Not including walk-up service, bulky items, extra collection. The majority do not use transfer stations.

[3]Approximately half include bulky items, spring clean up. Only Minneapolis includes walk-up service. The majority do not use transfer stations.

[4]Minneapolis includes walk-up service, bulky items, extra collection, but not commercial or industrial wastes.

Why is it that refuse collection is more expensive when the household arranges for collection services than when the municipality contracts for it? National studies completed by the Center For Government Studies of the Graduate School of Business at Columbia University have shown that prices paid by households for contract or franchise collection where it was mandatory to use the designated private collector are lower than those prices paid by households who use a private firm which is not under contract to the city or which does not have an exclusive franchise. The studies noted that the difference in price can be attributed to economies of scale and economies of contiguity (for example, the ability to service all households along a given route, thereby reducing travel time between stops) achieved by firms under contract and exclusive franchise as well as lower billing costs associated with firms under contract. The study was based upon a survey of 2,060 cities with a combined population of 52 million people.

A recent study completed for Carver County by John and Michele Genereux described the refuse collection industry in the county. Although statistical tests were not completed on comparing the costs of providing refuse collection services among the municipalities within the county, Table 4 shows that monthly costs to the household are about $1.50 to 3.20 per month less where organized collection exists. For example, households in the cities of Mayer, Hamburg and New Germany pay $5.73 per month for refuse collection as opposed to households in the cities of Chanhassen, Chaska, Carver, Victoria, Cologne and Waconia, which do not have organized collection, pay $7.80 to 9.50 per month. All the waste in Carver County is disposed of at the Louisville landfill.

Table 4
CARVER COUNTY RESIDENTIAL REFUSE COLLECTION CHARGES
TO HOUSEHOLDS*

Community	Number of Haulers	Median Monthly Residential Rate
Carver	2	8.00
Chanhassen	7	7.00 - 9.50
Chaska	5	8.00 - 9.50
Cologne	5	7.80 - 9.50
Mayer/Hamburg/New Germany	1	5.73
Norwood	1	6.60
Victoria	3	7.80 - 9.50
Waconia	2	7.80 - 8.00
Watertown	1	6.30 - 8.00
Young America	1	6.30

*Source: A description of the private waste hauling system in Carver County. For the county of Carver. John P. and M. Michele Genereux. Feb. 26, 1985.

The elimination of overlapped collection routes provides for increased efficiency for collection of wastes. It allows a collector to pick up refuse from more households within the same amount of time. The city of St. Paul, when it considered organized collection of refuse, estimated that a collector could do at least 50 more pickups in an eight-hour day, an increase of 20 percent. Waste collectors in Minneapolis noted similar increases in efficiency when collection services were organized.

Additional efficiencies could be achieved with the establishment of transfer stations in the region. Even if collection routes were organized, all haulers in St. Paul for example, must still travel at least 30 miles to the landfill. Each collector spends at least one hour and 20 minutes on the average delivering waste to the landfill. A transfer station would permit a hauler to collect from more households if less time is spent traveling to and from the landfill. Similarly, labor costs are reduced because more households can be serviced within the same amount of time by one person.

Transfer stations significantly reduce operating and maintenances costs of refuse collection. However, they do increase the capital costs of solid waste management. These costs should be considered in view of the reduced mileage and travel time spent by refuse trucks going to the landfill. Currently, there are few transfer stations in use in the region. The travel distance to the landfill is an important factor in the costs of solid waste management.

All the municipalities in the region that have some form of organized collection system with a contract are listed in Table 5. Costs per household range from $3.88 for Wayzata to $8.50 for St. Bonifacius. There does not appear to be any substantial difference in the type or level of service provided to Wayzata or St. Bonifacius. Other factors, such as the distance from the cities to the landfill, the one contractor might have bid the job at a loss, may play a role in the difference. Some of the differences in costs among the cities with contract collection are attributable to different levels of service (curbside or alley pickup versus walk-up); collection of bulky items; distance to the landfill; recycling programs; and profit percentages. Administration and monitoring costs amount to about five percent of the total cost of the contract according to the study be Ecodata, Inc. It is unclear whether cities recover their costs for billing expenses. Some contracts specify the company to provide an on-call supervisor for handling complaints.

Altogether, cities that have organized refuse collection have service costs about one-fourth to one-third less than those relying on individual households to arrange for collection services. The cost for refuse collection to households in contract cities is consistently less expensive than for households that make their own arrangements for refuse collection. It appears these cost differences can be accounted for by the market structure of the collection services, that is, organized versus unorganized. Other unknown factors may play a role in the cost

Table 5

METROPOLITAN AREA MUNICIPALITIES WITH CONTRACTED RESIDENTIAL REFUSE COLLECTION: APRIL 1985

Municipality	Estimated[1] Housing Units Served	Density Housing Units Per Acre	Monthly Charge	Senior/ Disabled Charge	Term of Contract	Maximum[2] Pickup Capacity (Gallons)	Bulky[2] Items Charge	Spring[2] Clean-up Included	Abatement Programs
Anoka	4,436	3.38	$ 7.00		yr.	80	Yes	No	No
Bayport	752	2.50	6.00	$ 4.00	2 yrs.	None	No	No	No
Blaine	10,552	3.26	6.62	4.90	3 yrs.	None	No	No	Yes
Columbia Heights	7,772	7.04	5.75	1.50	2 yrs.	75	Yes	No	No
Deephaven	1,300	1.28	6.33		2 yrs.	64	Yes	No	No
Excelsior	1,316	6.41	5.53	4.30	2 yrs.	60	Yes	Yes	Yes[3]
Hamburg	186	3.87	5.73		yr.				
Hopkins	7,614	9.26	4.50		5 yrs.	None	No	No	Yes
Mayer	145	2.92	5.73		yr.				
Minneapolis	62,000	12.87	5.18		5 yrs.	None	No	Yes	Yes[3]
Minnetonka Beach	211	1.44	Taxes		yr.	None	No	Yes	No
New Germany	146	4.34	5.73		yr.				
Oak Park Heights	1,164	5.61	6.75		6 yrs.	None	No	No	No
Osseo	1,042	5.23	7.00		2 yrs.	60	Yes	No	No
Robbinsdale	5,846	7.04	5.61		5 yrs.	None	No	No	Yes
St. Bonifacius	347	2.34	8.50		yr.	90	Yes	No	No
St. Louis Park	19,012	6.76	5.90		3 yrs.	None	No	Yes	Yes[3]
Shakopee	3,703	3.42	5.25	3.40	2 yrs.	None	No	No	Yes[3]
Stillwater	4,503	3.40	7.60	6.45	13 yrs.	None	No	Yes	
Tonka Bay	552	2.28	4.69	2.35	3 yrs.	60	Yes	No	No
Wayzata	1,716	1.53	3.88		3 yrs.	90	Yes	Yes	No
White Bear Lake	7,642	3.08	7.15	2.15	3 yrs.	None	No	No	No
Young America	443	3.29	6.30		3 yrs.	90	Yes	Yes	No

1. April 1, 1984 Housing Unit Estimates. Metropolitan Council.
2. Items specifically stated in contracts may not reflect actual practice.
3. Program agreements with firms or organizations other than the contracted residential refuse hauler.

differences. Figure 5 highlights the differences in cost to the household per month for refuse collection when there are one or more haulers servicing a municipality. The increased costs in the household agreement system which averages $8.21 per month are due to the extra costs associated with the non-exclusivity of collection in a given area.

Municipalities or townships with franchise collections are listed in Table 6. The costs to the household per month under a franchise arrangement range from a low of $4.32 for Jordan to a high of $8.75 for Afton. The average cost per month for all the franchise arrangements is $7.03. All but one of the franchise agreements are negotiated between the waste hauler and the city.

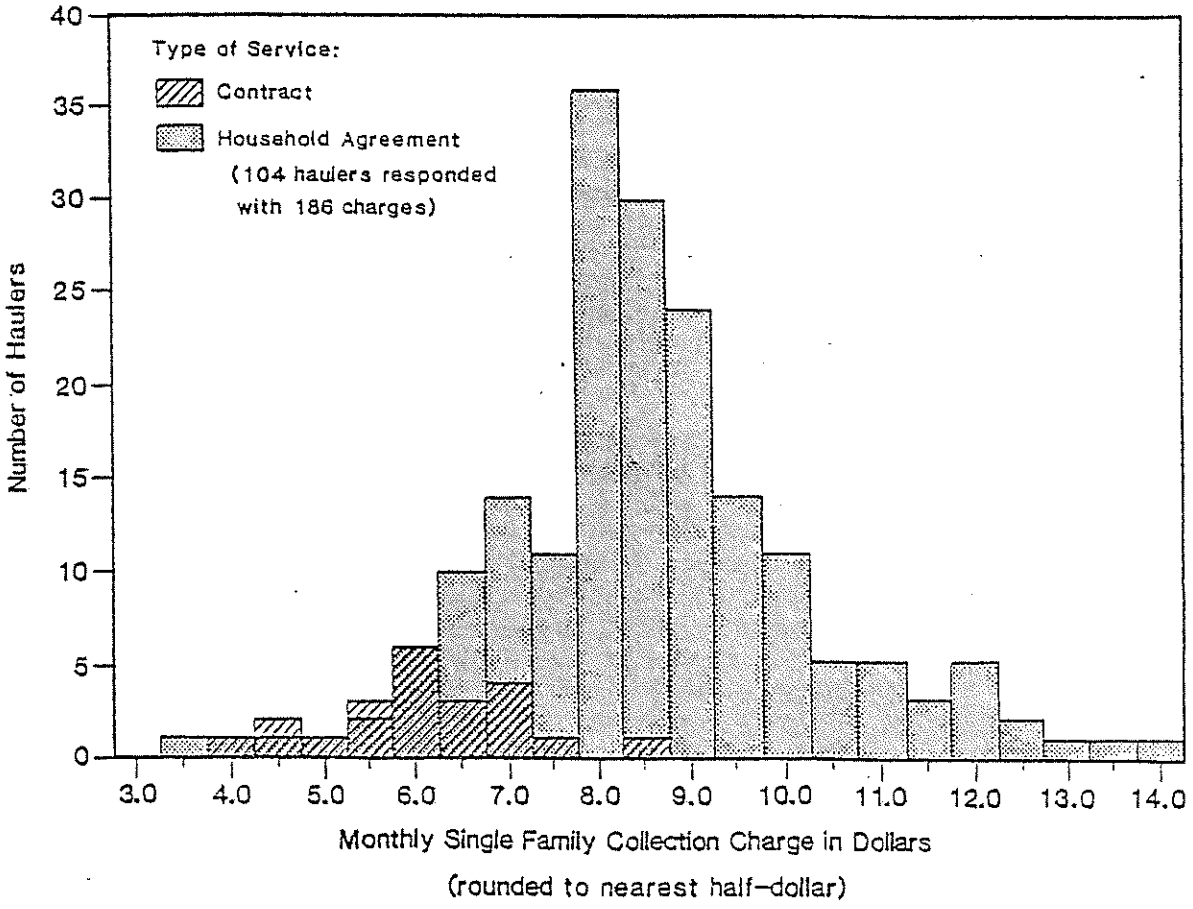
There is little information available to document whether organized collection of commercial and industrial refuse could result in cost savings to the waste generator. Based upon the available data from residential refuse collection, it is reasonable to infer that some of the diseconomies associated with each commercial waste generator arranging for refuse collection exist as it does for the residential sector. Presumably, some cost efficiencies could be achieved if service to commercial waste generators could be provided for in conjunction with organized collection of residential refuse. Additional study is needed to document whether a reduction in costs is realistic. Furthermore, the practicality of an organized collection system for commercial waste generators depends on several factors including the type of waste requiring disposal, frequency of service, proper collection equipment and suitable pricing arrangements. Appropriate commercial establishments could be folded into an organized residential collection route.

Refuse collection services are in many ways similar to a utility's function and services such as water, sewer, or electricity. The demand for refuse collection services, as for most utilities, is inelastic, that is people have a need for the service but do not demand more service if the price goes down. If demand is inelastic, economic theory says that tax increases will pass through to the consumer of the service or goods. Households in the region have experienced increases in their bills as a direct result of the surcharge on tipping fees at the landfill. Most increases were about 50 cents per household per month or $6 annually. This is approximately the increase that could be expected as a consequence of the surcharge if it were all passed directly back to the consumer based upon the amount of waste generated by a typical household in one year. At least one contract between a municipality and hauler, Hastings, was recently renegotiated as a direct result of the surcharge on disposal fees according to a city official. Columbia Heights provided a clause in its contract for complete reimbursement of additional landfill fees approved after 1985.

Figure 5.

FREQUENCY OF RESIDENTIAL REFUSE COLLECTION CHARGES

(MAY 1985)



Source: Metropolitan Council survey, May 1985.

Table 6

METROPOLITAN AREA MUNICIPALITIES WITH FRANCHISED RESIDENTIAL REFUSE COLLECTION: APRIL 1985

Municipality	Estimated[1] Housing Units Served	Density Housing Units Per Acre	Monthly Charge	Senior/ Disabled Charge	Term of Agreement	Type of Agreement[3]	Maximum[2] Pickup Capacity (Gallons)	Bulky[2] Items Charge	Spring[2] Clean-up Included	Abatement Programs
Afton	822	1.74	$ 8.75		1 yr.	Neg.	90	Yes	No	No
Birchwood	353	3.26	7.16		1 yr.	Neg.	90	Yes	No	No
Centerville	298	2.43	6.30	$ 5.30	5 yrs.	Neg.	None	No	Yes	No
Hastings	4,592	3.34	8.50		1 yr.	Neg.	90	Yes	No	No
Jordan	1,001	2.50	4.32		2 yrs.	C.B.	None	No	Yes	Yes
White Bear	2,342	2.44	7.15	3.57	5 yrs.	Neg.	None	Yes	No	No

1. April 1, 1984 Housing Unit Estimates. Metropolitan Council.
2. Items specifically stated in agreements may not reflect actual practice.
3. Negotiation or competitive bidding.

CAN ORGANIZED COLLECTION REDUCE ENVIRONMENTAL IMPACTS AND IMPROVE PUBLIC SAFETY?

Organized collection does reduce nuisance impacts associated with several refuse collectors picking up waste on the same block. Organized collection reduces wear and tear on roads and improves air quality because fuel consumption is reduced. Organized collection improves public safety because fewer miles are traveled by garbage trucks thereby decreasing the potential for accidents.

The expected life of any street or alley surface is related to the traffic which is carried by the street or alley. The roadway surface is particularly affected by heavy wheel loads. The effect on a roadway of one refuse truck is equivalent to 1,500 automobiles. This figure has been documented by the Research Section of the Minnesota Department of Transportation (Mn/DOT) and is currently used by Mn/DOT in street and highway design.

In its organized collection efforts, St. Paul estimated to what degree the life of a street can be extended if refuse collection were organized. The city assumed that if under the current system, where each household arranges for collection, traffic volume on a given street is 500 cars per day and five refuse trucks per week, the equivalent traffic on the street amounts to 11,000 cars per week. Under an organized collection system with only one refuse truck per week, the equivalent traffic on the street is 5,000 cars per week. The comparison shows that the effect on the roadway by traffic may be substantially reduced.

Realistically, all streets might not last substantially longer under an organized collection system because roadway life is dependent upon many other factors than traffic. However, traffic does have a significant effect upon roadway life. These additional roadway costs are external costs passed on the the city as a consequence of each household arranging for refuse collection.

The reduced mileage that refuse trucks travel can reduce the potential number of accidents involving garbage trucks. Reducing the number of miles traveled by garbage trucks reduces traffic congestion and may reduce the number of accidents.

Emissions of air pollutants would be reduced because garbage trucks would reduce total mileage. The precise reduction in pollutants as a result of moving to an organized collection system is difficult to predict because there are both gasoline and diesel powered collection vehicles, and it is difficult to estimate the reduction in traffic congestion and miles traveled by garbage trucks that would be achieved by organized collection. The emission rates of pollutants vary according to the speed of the vehicle with more emissions at lower speeds. Emissions of importance include hydrocarbons, carbon monoxide and nitrogen oxides. Heavy duty diesel trucks also emit particulates,

sulfur oxides, aldehydes and organic acids. Of particular concern are particulate emissions from diesel engines because they contain polynuclear aromatic hydrocarbons (PAH) which are known carcinogens.

Organized collection is one of several methods that could improve neighborhood aesthetics. It could eliminate the unsightliness of containers set out for collection sometimes every day of the week on some blocks. Organized collection could discourage illegal dumping and stockpiling of unwanted and unsightly items in backyards because the costs of removal are generally extra where a household arranges for collection with a waste hauler. Reducing litter, dumping and stockpiling could contribute to public health and safety.

CAN ORGANIZED COLLECTION FACILITATE IMPLEMENTATION OF THE COUNCIL'S SOLID WASTE GUIDE CHAPTER?

This section of the report will evaluate to what extent organized collection can facilitate attainment of the objectives for waste management contained in the Council's solid waste policy plan. Three main areas of concern are the objectives for recycling, management of household hazardous wastes and improved data collection and management.

Organized collection of mixed municipal solid waste will not necessarily increase participation in recycling activities or the amounts of materials recycled. The hauler providing collection services for recyclables, if operating under the system where each household arranges for collection services, is at a competitive disadvantage because the revenues from recyclables may not cover the additional collection costs. This is one reason why few refuse haulers in the Metropolitan Area provide for comprehensive recyclables collection. If a hauler does provide for recyclables collection, it is probably for a limited number of materials, that which can be collected in racks attached to the packer truck.

In some communities in the Metropolitan Area where franchises or contracts are provided for by the municipality, some haulers are providing for recyclables collection or separate collection of yard waste to reduce their cost at the landfill. A municipality can more easily provide monetary or other incentives to the hauler, household or business to participate in source separation activities if collection is organized.

Under the system where each household arranges for collection service, haulers have the opportunity to assess the household's fee based upon the volume of refuse collected. As land disposal fees rise and become a greater percentage of total cost of solid waste management, one would expect differences in monthly rates attributable to the amount of refuse generated. This provides direct feedback to the household or waste generation as opposed to most existing contract arrangements where all households pay the same monthly fee regardless of the volume of waste generated. However, a variable rate could be established under a contract arrangement if so desired by the municipality.

In regards to data collection and management, a municipality with organized collection, depending upon how it is implemented, more easily can facilitate the development of a comprehensive data collection and management system for solid waste. Organized collection could facilitate collection of information about the quantities of waste generated, recycled or processed in municipalities by population or households, or businesses. This information could be used by the Council and counties to target incentives for abatement programs and focus the direction of the Metropolitan Abatement Fund grant and loan program administered by the Council.

CAN ORGANIZED COLLECTION INTEGRATE OR ENHANCE EXISTING COUNTY AND LOCAL AUTHORITIES FOR WASTE MANAGEMENT?

Currently, municipalities have the authority for provision of waste collection services. Municipalities have the authority to implement resource recovery facilities by virture of its authority over collection of waste. Counties, on the other hand, have responsibility for overall waste management within the county but may not have the authority for requiring collection services. Consequently, in the past, development of resource recovery facilities by the counties is made more tentative because of their lack of authority to ensure a waste flow to the facility.

Currently, state law provides counties with the authority for waste designation. This authority enables the county to direct the flow of refuse to a designated resource recovery facility. The provisions enabling county designation were adopted in 1980.

The general issue of need for designation (flow control) has been debated by the legislature for the past 10 years. When the Legislative Commission on Waste Management was created in 1980, it was charged in part with studying alternative methods of insuring adequate waste supplies for resource recovery facilities. The Commission's report, completed in 1982, concluded that the feasibility of resource recovery facilities is dependent upon waste supply, the soundness of the technology and markets for the recovered product. The Commission found that the waste stream must be assured in some manner to assure financing and to permit efficient operation. Generally waste is assured by requiring delivery to a facility, but the Commission recognized that under rare circumstances, such as the lack of any other disposal alternative, explicit waste assurance might not be needed.

The system of refuse collection where each household and business independently arranges for waste collection service makes the development of resource recovery facilities more complicated because an individual hauler cannot guarrantee delivery of waste to a resource recovery facility. From day-to-day or month-to-month, the waste generator's decision on which hauler to use can change. Though the waste is still there and must be collected, there is no assurance that the new waste hauler will deliver the waste to the same facility the previous collector used.

In other parts of the country, several resource recovery facilities rely on long-term contracts with municipalities for their waste supply. In some cases the municipal workers collect the waste and in others, the city contracts with private haulers for the service. In these cases organized collection merely substitutes municipal designation for county designation. Because few Twin Cities communities provide collection service, this approach is not available in our region. There is only one municipality in the region that generates enough waste by itself to construct even a medium-sized resource recovery facility, that is a facility that could manage about 500 tons per day.

Currently, none of the Metropolitan Area communities that contract for service specify where waste is to be delivered for disposal; that choice is left to the hauler. Specification of a disposal site, however, could be incorporated as part of the service agreements. This is one way in which organized collection could potentially be a strong complement to waste designation. If successfully negotiated, contracts between resource recovery facilities and municipalities could provide for delivery of adequate waste supplies. In a parallel vein, haulers operating under collection service agreements would have an enhanced capability to contract with recovery facilities for delivery of waste. In either case, the effort and complexity required to enforce waste designation could be substantially lessened. The degree of this effect would be directly proportional to the length of the contracts.

LIABILITIES AND DISADVANTAGES OF ORGANIZED COLLECTION

There are four potential liabilities or disadvantages to organized collection of refuse. Organized collection reduces an individual's choice of garbage collectors, requires additional municipal involvement, broaches anti-trust issues and could potentially adversely affect existing refuse collection companies.

Households that currently arrange with a hauler for refuse removal would no longer be able to select the hauler of their choice. This runs counter to the nationwide trend of permitting individuals more choice in the type and level of services desired. However, a survey by the Minnesota Center for Social Research completed Mar. 29, 1985, showed broad-based support for municipal control, with 77 percent of those respondents who now select their garbage hauler willing to let the city decide, although some agree only if it reduces their cost.

There was a small minority, about 11 percent of the population, or about 20 percent of the respondents who selected their garbage hauler, who felt strongly that they wanted to retain choice. The study suggested that this group be studied further to identify their concerns.

Organized collection will require municipalities with unorganized refuse collection to become more involved in refuse collection issues. Because there is a great deal of satisfaction among households and businesses about the manner in which refuse is handled, it may be difficult to explain why additional government involvement is necessary. Municipalities will have to overcome the concern, "If it ain't broke, why fix it?" Although the cost differentials to the households of the different market structures is not great, the sum of the costs to all the households in the city over a period of a year's time can be significant. For example, if St. Paul went to an organized collection system, it could expect an annual savings of at least $1 million based upon 64,986 single-family housing units and a $1.50 differential in cost per household per month.

Municipalities will incur costs associated with administration, billing and monitoring performance of the contract. Billing can be done in conjunction with other municipal billings such as property tax statements or utility bills. National studies show that billing expenses are much less if handled by the municipality rather than the waste hauler. Administration and monitoring costs amount to about five percent of the total cost of the contract according to the study by Ecodata, Inc.

How organized collection is implemented in the region may be affected by anti-trust law. This matter requires additional study.

Implementation of organized collection by municipalities has the potential to adversely impact some refuse collection companies. An increase in productivity means that fewer people are needed to perform the same

function. Consequently, fewer collection crews would be needed to collect refuse under an organized collection system. Whether this means a reduction in collection companies depends upon how organized collection is implemented. The businesses of some waste haulers, particularly those operating part-time or collecting waste as a job on the side, may be adversely affected.

The implementation of the waste management system envisioned by the Council's solid waste policy plan may work to offset any negative impacts upon the collection industry as a result of organized collection. The provision of collection services for yard waste, recyclables and household hazardous wastes may compensate for the reduction in the labor force if organized collection were implemented by a significant number of cities in the region. Also, there is an opportunity for new business ventures into management of the yard waste compost sites or recyclables processing facilities. The expansion or development of new industries as a result of increased recycling activities could also increase the demand for labor.

FINDINGS AND CONCLUSIONS

1. Organized collection may reduce the costs of residential refuse collection by increasing collection efficiencies. Additional study is needed to determine if organized collection may benefit commercial and industrial waste generators.

2. Organized collection reduces adverse environmental impacts when more than one hauler services a given area or provides the same type of collection service.

3. Organized collection does not inherently increase participation in recycling or other abatement programs. It can be implemented in ways that would help to achieve the abatement objectives of the Solid Waste Management Guide/Policy Plan.

4. Organized collection cannot substitute for waste designation by the county, but can complement it.

5. Municipalities and towns have adequate authority to organize collection of residential refuse.

6. Organized collection of residential refuse may be a net benefit to solid waste management because it may reduce costs and environmental impacts; help implement abatement programs; and improve information about waste generation, composition and abatement.

7. There is no need for a regional system for implementation of organized collection. However, individual communities should consider the potential benefits of organized collection.

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APPENDIX
REFUSE COLLECTION COMPANIES OPERATING IN THE REGION

A & A Rubbish Removal
2[illegible] - 30th Av. S.
M[illegible]eapolis, MN 55406

AA Rubbish Service, Inc.
1300 Winslow Av.
West St. Paul, MN 55118

A & B Trucking
187 James Av. N.
Minneapolis, MN 55405

Aace Rubbish Removal
520 Sunny Acres La.
Burnsville, MN 55337

Aagard Sanitation
3308 - 10th Av. S.
M[illegible]eapolis, MN 55407

Ace Solid Waste Management, Inc.
3118 NW. 162 La.
Anoka, MN 55303

Action Disposal Systems, Inc.
4300 E. 65th St.
Inver Grove Heights, MN 55075

Adams Disposal
P. O. Box 7342
Minneapolis, MN 55407

Admiral Waste Management
8275 Tamarack Trail
Eden Prairie, MN 55344

[illegible] All Season
[illegible] Russell Av. N.
Minneapolis, MN 55411

American Systems, Inc.
84 W: Water St.
St. Paul, MN 55107

Ray Anderson & Sons Cos. Inc.
930 Duluth St.
St. Paul, MN 55106

Anderson's Hauling
6925 Humbolt Av. N.
Brooklyn Center, MN 55429

Anderson Rubbish
918 Scheffer
St. Paul, MN 55102

Andy's Disposal Service
781 Englewood Av.
St. Paul, MN 55104

Arrow Rubbish Service
1700 E. 84th St.
Minneapolis, MN 55420

Art Willman & Son Trucking
62 - 26th Av. N.
Minneapolis, MN 55411

Baldy Sanitation
5906 Henry St.
Maple Plain, MN 55355

Barnes Sanitary Service
1917 Emerson Av. N.
Minneapolis, MN 55403

Bateman's Rubbish, Inc.
520 White Bear Av. N.
White Bear, MN 55119

Bateman's Rubbish Removal
2239 Matterhorn La.
St. Paul, MN 55119

Bautch Disposal Service
10264 Xylite St. NE.
Minneapolis, MN 55434

Beckers Sanitation
18681 Yakima
Anoka, MN 55303

Beermann Services
6900 Dixie Av. E.
Inver Grove Heights, MN 55075

Bellaire Sanitation Service
8678 N. 75 St.
Stillwater, MN 55082

Bergstrom Trucking Service
5860 - 73 Av. N.
Brooklyn Park, MN 55429

Ken Berquist & Son
1232 Juliet Av.
St. Paul, MN 55105

Big Garbanzo
15238 Central Av. NE.
Ham Lake, MN 55303

Bill's Sanitation
1570 Waterloo
South St. Paul, MN 55075

Blakowiak & Sons
1195 Sunnyfield Rd. N.
Mound, MN 55364

Block Sanitation
6741 - 79 Av. N.
Brooklyn Park, MN 55445

Box Inc.
6010 Concord Blvd.
Inver Grove Heights, MN 55075

Brennan Rubbish Service
2145 University Av. W.
St. Paul, MN 55114

Brooklyn Disposal
7358 NW. 191 La.
Anoka, MN 55303

Buckingham Disposal
12585 Rhode Island Av. S.
Savage, MN 55378

Capital City Disposal
8270 Neal Av. N.
Stillwater, MN 55082

Carey Rubbish Service
7987 Afton Rd.
St. Paul, MN 55125

Ken Carlson Disposal Service
P. O. Box 326
Isanti, MN 55040

H. H. Carpenter
4443 Snelling Av.
St. Paul, MN 55112

Casanova Brothers Trucking
515 Ohio
St. Paul, MN 55107

Jimmie Cashill, Inc.
688 S. Victoria St.
St. Paul, MN 55102

Chaska Sanitation
1239 Valley St.
Chaska, MN 55318

City Clean-Up
1455 Perron Rd.
St. Paul, MN 55120

City Clean-Up
2841 Burnside Av.
Eagan, MN 55121

Cleanway Sanitation
Box 220
Long Lake, MN 55356

Johnnie Coolidge
783 Fuller Av.
St. Paul, MN 55104

Corrow Sanitation
15520 Lawndale La.
Dayton, MN 55327

Countrywide Sanitation
4 Inver Dr.
Circle Pines, MN 55104

Countrywide Sanitation
Box 117
Montrose, MN 55763

Crosstown Sanitation, Inc.
10110 - 38 Av. N.
Plymouth, MN 55441

Dana's ECO Services
3313 Valley View Dr.
Burnsville, MN 55337

Dan's Disposal
309 NW. 202 La.
Cedar, MN 55011

Dave's Roll-Off Contracting Service
3801 Lovell Rd.
New Brighton, MN 55112

Dave's Sanitation
4072 Hamel Rd.
Hamel, MN 55340

Denny's Roll Off Service
5816 W. 70 St.
Minneapolis, MN 55435

Dependable Services
105 Clover La.
Delano, MN 55328

D & D Hauling
6474 - 12 Av. S.
Lino Lakes, MN 55014

D & D Hauling
1234 Farrington
St. Paul, MN 55117

Dick Clemmer Sanitation Serv.
21338 Dodd Blvd.
Lakeville, MN 55044

Dirty Jim's Rubbish Removal
761 Iowa Av. W.
St. Paul, MN 55117

[illegible]osal Systems, Inc.
[illegible] N. Albert
[illegible]. Paul, MN 55104

Do All Service
12863 Keller Av. N.
Hugo, MN 55038

Dugan Sanitation Service
4070 Cavell Av. N.
New Hope, MN 55428

Eagle Sanitation
P. O. Box 128
Newport, MN 55055

Eagle Sanitation
[illegible]2 Woodlane Dr.
[illegible]dbury, MN 55125

East Tonka Sanitation
8100 Odean Av. NE.
Elk River, MN 55330

Eden Prairie Trashtronics
7298 Prairie View Dr.
Eden Prairie, MN 55344

Ed's Trucking
333 E. Lawson Av.
St. Paul, MN 55101

Eisinger Sanitation
15843 S. 45 St.
Afton, MN 55001

[illegible] River Sanitation
14889 NE. 81 St.
Elk River, MN 55330

Expert Disposal, Inc.
13200 Pilot Knob Rd.
Apple Valley, MN 55124

Forest Lake Sanitation
8247 - 178 La.
Forest Lake, MN 55025

Fragrance Solid Waste, Inc.
99 - 99th La. NW.
Coon Rapids, MN 55433

Franck's Sanitation
131 Casper St.
Norwood, MN 55368

Gallagher's Service, Inc.
1691 - 91 Av. NE.
Minneapolis, MN 55434

Gene's Disposal Service
6808 N. 117 St.
White Bear Lake, MN 55110

Gopher Disposal
P. O. Box 6
Newport, MN 55055

Gordy's Roll Off
402 N. Main St.
Stillwater, MN 55082

Gordy Rubbish Removal
637 - 4th Av. S.
South St. Paul, MN 55075

W. D. Gray Trucking
1036 Central Av. W.
St. Paul, MN 55104

Gunderson Rubbish
1086 - 2nd Av.
Newport, MN 55055

Gustafson Sanitary Service
2741 - 12 Av. S.
Minneapolis, MN 55407

William Guy Sanitation Servic
Box 23, Route 1
Stacy, MN 55079

Lloyd Hall
4355 Fisher Lane
White Bear Lake, MN 55110

Hastings Sanitation
1617 Ashland
Hastings, MN 55033

Haul-A-Way Systems
400 Whitall
St. Paul, MN 55100

Highland Park Sanitation Serv
1801 Century Av.
Newport, MN 55055

Hilger Transfer
8550 Zachary La.
Maple Grove, MN 55369

Hillcrest Sanitation
6748 Military Rd.
Woodbury, MN 55125

Hollie's Rubbish Service, Inc
2109 Lowry Av. N.
Minneapolis, MN 55411

Hollie's Rubbish Service, Inc.
5533 Logan Av. N.
Minneapolis, MN 55430

Joe Horrigan
321 E. Arlington Av.
St. Paul, MN 55101

Humphrey's Rubbish
970 Central Av. W.
St. Paul, MN 55104

Jacobson Sanitary, Inc.
7501 Portland Av.
Richfield, MN 55423

James Solid Waste Disposal, Inc.
1700 Oliver Av. N.
Minneapolis, MN 55411

James Solid Waste Disposal, Inc.
2021 W. Broadway
Minneapolis, MN 55400

Janish Disposal
14864 Central Av. NE.
Anoka, MN 55303

Jim's Rubbish Removal
761 W. Iowa Av.
St. Paul, MN 55117

Johnny's Rubbish, Inc.
641 St. Anthony
St. Paul, MN 55104

Johnson Sanitation
125 Bunker Lake Blvd. NW.
Anoka, MN 55303

Junker Sanitation
417 Martha
Stillwater, MN 55082

Ben Karas Trucking
515 Century Av.
Newport, MN 55055

H. P. Kelley Hauling Service
3930 - 3 Av. S.
Minneapolis, MN 55409

Klean-Up
10010 Trenton La.
Osseo, MN 55369

Klein Sanitation
10690 - 100 Av.
Osseo, MN 55369

Knutson Rubbish Service, Inc.
14345 Biscayne Av.
Rosemount, MN 55068

Kowski Rubbish Removal Serv.
1560 Oakdale Av.
West St. Paul, MN 55118

Krause Rubbish Removal Service
1620 W. 7 St.
St. Paul, MN 55102

Kieth Krupenny & Sons
1214 Hall Av.
West St. Paul, MN 55118

Krupenny & Sons Disposal Serv.
1330 Galvin Av.
West St. Paul, MN 55118

Kubash & Sons Sanitation,
RR
Winsted, MN 55395

Lake Sanitation
1201 N. Birch Lake Blvd.
White Bear Lake, MN 55110

Lakers Disposal
3275 E. 260 St.
Webster, MN 55088

Lakeville Sanitary, Inc.
10200 W. 199 Way, Box 336
Lakeville, MN 55044

G. O. LaPlant Sanitation, Inc
P. O. Box 334
Buffalo, MN 55313

Larry's Quality Sanitation
17210 Driscoll
Anoka, MN 55303

Larson Hauling
13940 N. St. Croix Tr.
Stillwater, MN 55082

L & M Disposal
1819 NE. Benjamin
Minneapolis, MN 55418

L & N Disposal
3417 - 85 Av. N.
Minneapolis, MN 55443

Letourneau Trucking
P. O. Box 224
Minneapolis, MN 55440

1320 Marshall Av.
St. Paul, MN 55104

Ji ogan Hauling
1 Dayton Av.
St. Paul, MN 55104

Loren's Rubbish Removal
3946 Washington Av. N.
Minneapolis, MN 55412

Steve Manthei Disposal Service
2624 - 14 Av. S.
Minneapolis, MN 55407

Mark's Sanitation
308 - 3rd St.
Carver, MN 55315

Maroney's Service, Inc.
9200 Lansing Av. N.
S iwater, MN 55082

Marv's Disposal
18233 Elmcrest Av. N.
Forest Lake, MN 55025

Marv's Disposal
1598 Hollywood Ct.
St. Paul, MN 55108

Mel's Trucking Service
127 W. Spruce St.
St. Paul, MN 55075

Mendota Heights Rubbish Serv.
Route 1, Box 120
Farmington, MN 55024

Metro Haul-A-Way Systems, Inc.
8168 W. 125 St.
Savage, MN 55378

1280 S. Point Douglas Rd.
St. Paul, MN 55119

Midwest Refuse
904 University Av.
St. Paul, MN 55104

Minneapolis Refuse Inc.
4649 Bloomington Av.
Minneapolis, MN 55407

M & M Sanitation
Rush City, MN 55069

Mobile Home Sanitation
2463 Lake George Dr.
Cedar, MN 55011

Mudek Sanitary Hauling
1900 Kolff St.
Newport, MN 55055

Mudek Trucking, Inc.
1520 Ames Av.
St. Paul, MN 55106

Francis J. Nash
3208 - 41 Av. S.
Minneapolis, MN 55406

Nistler Rubbish Removal
21203 Horseshoe Trail
Hamel, MN 55340

Nitti Disposal, Inc.
6639 E. Concord Blvd.
Inver Grove Heights, MN 55075

North End Sanitation
1127 Albemarie
St. Paul, MN 55117

and Transfer
8550 Zachary La.
Osseo, MN 55369

Ben Oehrlein & Sons & Daughter, Inc.
9091 Concord Blvd.
Inver Grove Heights, MN 55075

Ken Oehrlein Sanitation Servic
1800 Century Av.
Newport, MN 55055

Ost Sanitation & Landscaping
280 Vincent Av. N.
Minneapolis, MN 55405

Oxford's Disposal Service
2305 E. Linwood Av.
St. Paul, MN 55119

Pastorek Rubbish
6300 Hwy. 101
Maple Grove, MN 55369

Paul and Andy's Disposal
729 - 109 Av. NW.
Coon Rapids, MN 55433

Peterson Brothers Sanitation
18605 Lake George Blvd.
Cedar, MN 55011

Pete's Rubbish Hauling
6360 N. 190 St.
Forest Lake, MN 55025

Piekert's Sanitation
RR #2, Box 139
Monticello, MN 55362

Poor Richard's, Inc.
400 Whitall
St. Paul, MN 55101

Pretzels Sanitation
15323 Ransey Blvd. NW.
Anoka, MN 55303

Prior Lake Sanitation
P. O. Box 536
Prior Lake, MN 55372

Property Refuse Removal Co.
6490 Excelsior Blvd.
St. Louis Park, MN 55426

Quality Waste Control, Inc.
1901 W. 144 St.
Burnsville, MN 55337

R & M Sanitation
858 S. Point Douglas Rd.
St. Paul, MN 55119

R & W Sanitation, Inc.
8470 Galpin Blvd.
Chanhassen, MN 55317

Randolph, Inc.
3824 Thomas Av. S.
Minneapolis, MN 55410

Randy's Sanitation
RR #3, Box 342
Delano, MN 55328

Rapid Way Disposal
685 - 123 Av. NW.
Coon Rapids, MN 55433

Rauschnot Rubbish Removal
9035 E. Concord Blvd.
Inver Grove Heights, MN 55076

Ray's Rubbish Service
3941 - 14 Av. S.
Minneapolis, MN 55407

Ray's Trucking Service
4413 Crawford Rd.
Minnetonka, MN 55343

Red Arrow Waste Disposal
44 E. Acker
St. Paul, MN 55117

Redepenning Sanitary Service
2076 County Rd. 90
Maple Plain, MN 55359

Reid Sanitation Service, Inc.
780 Elrene Court
Eagan, MN 55121

J. J. Remackel & Sons
1032 Jessamine Av. E.
St. Paul, MN 55106

Remackel Trucking
1263 Leland Rd.
Maplewood, MN 55109

Richie's Rubbish Service, Inc.
19447 Baugh St. NW.
Elk River, MN 55330

Roadway Rubbish Service
2400 Dodd Rd.
Mendota Heights, MN 55150

Robbinsdale Transfer Company
5232 Hanson Court
Crystal, MN 55429

Ron's Sanitation Service
813 Mary St.
Maplewood, MN 55119

Shakopee Services
730 - 3rd Av. W.
Shakopee, MN 55379

Saver's Rubbish Removal
1307 - 6 Av. S.
South St. Paul, MN 55075

Scherer Sanitation
P. O. Box 272
Delano, MN 55328

O. Shoebe & Son Disposal Service, Inc.
3621 - 85 Av. N.
Minneapolis, MN 55429

Lenny Saloka
4843 - 263 St.
Wyoming, MN 55092

Solid Waste Service, Inc.
12461 Boone Av. S.
Savage, MN 55378

Space Center Transport, Inc.
1145 Homer St.
St. Paul, MN 55116

Stromme Sanitation Service
14331 Lake Dr.
Forest Lake, MN 55025

Stromme Sanitation Service
Route 2, Box 422-S
Hudson, WI 54016

Suburban Sanitation
570 S. Orono Orchard Rd.
Orono, MN 55323

Sunrise Sanitation
Box 307, 464 - 2 St.
Excelsior, MN 55331

Superior Truck Disposal Serv.
Route 3, Box 341
Delano, MN 55328

T & L Sanitation Service
8201 Logan Av. N.
Brooklyn Park, MN 55443

Recycling Transfer Station
318 W. Water
St. Paul, MN 55118

[illegible]
10050 NE. Naples St.
Blaine, MN 55434

[illegible]is Sanitation
[illegible] - 4th St.
St. Paul Park, MN 55071

Van's Rubbish Service
1215 Lealand Rd.
St. Paul, MN 55109

Waste Management, Inc.
12248 Pennsylvania Av. S.
Savage, MN 55378

Tennis Sanitation
1026 Dayton Av.
St. Paul Park, MN 55071

George Vasko Rubbish Removal
1591 Hoyt Av. E.
St. Paul, MN 55106

Waste Technology
410 - 11 Av. S.
Hopkins, MN 55341

Town and Country Disposal Serv.
4875 Dodd Rd.
Eagan, MN 55123

Ernest A. Vierkant Disposal
6045 Xerxes Av. S.
Minneapolis, MN 55410

Weber's Hauling
424 - 3rd Av. NE.
Osseo, MN 55369

Town and Country Disposal Serv.
Box 137
Delano, MN 55328

Viking Disposal & Building
Service, Inc.
2800 W. 109 St.
Minneapolis, MN 55431

Weller's Disposal Service
4020 Harriet Av.
Minneapolis, MN 55409

T & R Sanitation
[illegible] 637
[illegible] Francis, MN 55070

Village Sanitation, Inc.
13125 Lone Oak Dr.
Minnetonka, MN 55343

Westonka Sanitation
P. O. Box 94
Navarre, MN 55392

Trash Gordon
4555 Ering Dr.
Eagan, MN 55123

Village Sanitation, Inc.
3186 W. 130 St.
Louisville, MN 55379

Westonka Sanitation
3146 Islandview Dr.
Mound, MN 55364

Triangle Rubbish Service
1881 Lexington Av. S.
Mendota Heights, MN 55118

Waconia Sanitation
P. O. Box 196
Waconia, MN 55387

Wildwood Sanitation
Box 176
Newport, MN 55055

Troje's Sanitation
8678 N. 75 St.
Stillwater, MN 55082

Waconia Sanitation
11585 Hwy. 5
Cologne, MN 55322

Wiley's Removal
492 W. County Rd. B-2
Roseville, MN 55113

Troje's Sanitation
P. O. Box 609
Willernie, MN 55090

Walz Brothers Sanitation
14033 Territorial Rd.
Maple Grove, MN 55369

Will & Steve's Sanitation Se
23955 NE. Fillmore
Bethel, MN 55005

Troje's Trash Pick-Up Service
6150 Military Rd., P. O. Box 40
Newport, MN 55055

Waste Control
95 Ivy Av. W.
West St. Paul, MN 55117

William Pick-Up Service, Inc
11751 Kumquat
Coon Rapids, MN 55433

Willie's Dumpster Service
7800 E. Buch Lake Rd.
Bloomington, MN 55420

William & Son Trucking
62 - 26 Av. N.
Minneapolis, MN 55411

H. Minnick Company
343 NW. 4th St.
Forest Lake, MN 55025

Woodlake Sanitary Service
9813 Flying Cloud Dr.
Eden Prairie, MN 55344

Woodlake Sanitary Service
4000 Hamel Rd.
Hamel, MN 55340

Woodlake Sanitary Service
8861 Renova
New Brighton, MN 55112

Wrisky Sanitation
1685 Cheri Lane
Newport, MN 55055

Wyda's General Hauling
1010 S. Plymouth Rd.
Minnetonka, MN 55343

Wynne's Rubbish Removal
748 Hyacinth Av. E.
St. Paul, MN 55106

Young's Rubbish Service
12328 May Av. N.
Stillwater, MN 55082

Gene's Sanitation Service
12520 Kelley Av.
Chaska, MN 55318

Roadway Rubbish Service
803 Hazel Court
St. Paul, MN 55120

A & E Rubbish Removal
18610 Excelsior Blvd
Minnetonka, Mn 55345

Blake & Son, Inc.
3461 Upper 143rd Street
Rosemount, Mn 55068

Elvine Disposal
15200 Northern Blvd.
Anoka 55303

Kutter's Rubbish Removal
4649 Bloomington Avenue S
Minneapolis Mn 55407

SAS Hauling
4900 31st Avenue S
Minneapolis 55417

Suburban Sanitation Inc.
P O Box 188
Wayzata 55391

Waste Conversion
6630 N Cortlawn Circle
Golden Valley 55426

Browning-Ferris, Inc.
9813 Flying Cloud Dr.
Eden Prairie, Mn 55344

ROSEVILLE

Public Works Department
Engineering
2660 Civic Center Drive ~ Roseville, MN 55113
Phone: 651-792-7003 Fax: 651-792-7040
www.cityofroseville.com

Fax

To: DEAN AMMRAL Fax: 360-423-6591

Organization: KELSO WASH Phone: _____

From: DUANE SCHWARTZ Phone: _____
CITY OF ROSEVILLE, MN.

Pages: _____
(Including this page)

Message: DEAN – ATTACHED IS COPY OF REPORT SECTION RELATING TO TRUCK TRAFFIC. WE CANNOT LOCATE THE SLIDE I PUT TOGETHER COMPARING TRUCKS TO OTHER TRAFFIC – THE FULL REPORT IS ON OUR WEBSITE UNDER PUBLIC INFORMATION AND THEN GO TO RECYCLING AND YARD WASTE SURVEY RESULTS THEN THE SOLID WASTE REPORT. CALL IF YOU HAVE QUESTIONS FOR MYSELF OR TIM PRATT.

DUANE SCHWARTZ

garbage, proof of insurance, annual notification to City and customers of rates, separate collection of yard waste and special waste (appliances, furniture, etc.), walk up service, give a choice of three different size containers. Most haulers charge extra for separate collection and for walk up service. Prices are based on the size of the garbage container. Although it's not clear that all haulers are meeting all these requirements. One resident in a focus group of homeowners said he switched garbage haulers because the one he originally had refused to arrange a special pickup of his yard waste.

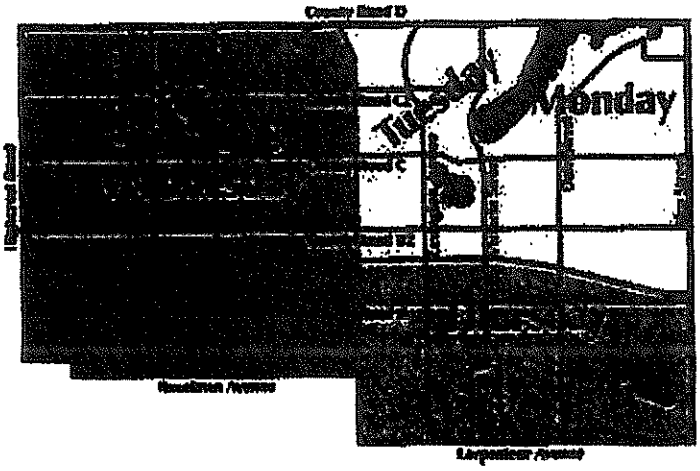
Companies are required to notify the City and customers at least 60 days in advance of any change in rates. Roseville has no rate change notifications on file for the past three years other than changes made when annual rates are filed. However phone calls from residents to City staff following the publishing of hauler rates in the January/February Roseville Wrap suggests customers are being charged a variety of rates not just the rate on file with the City.

There is no monitoring to ensure haulers are following the terms of their licensing. Even if the City were to find a company in non-compliance revoking a license would be an unlikely occurrence because of the ensuing negative reaction from that company's customers.

Companies typically bill quarterly. Many bill for the quarter to come. The billing system used by the haulers makes it so that residents are unable to switch haulers mid-quarter and receive a rebate.

Effect of Traffic

Following the 1991 report Options for Residential Waste Collections and Recycling for Roseville the Council divided the City into five zones. Garbage and recycling service is restricted to a specific day of the week for each zone (see map below).



According to Thor Bank who was chair of the 1991 committee that authored the report, the committee recommended the zone system to restrict garbage and recycling truck traffic to one day a week. Before that haulers could chose the day of service. Bank said residents did not like garbage trucks driving down their streets four or even five days a week and residents were concerned about pollution, noise and safety. Some haulers have complained that going to zones is an unfair restriction on their business. But residents in the focus group said they are quite happy that truck traffic is restricted to one day a week.

A minority of residents still has concerns about the amount of truck traffic on their streets. In the 2002 resident survey 22% were concerned about the effect garbage trucks have on air pollution,

20% on noise pollution, 17% on safety, 16% on street maintenance, 11% on neighborhood appearance while 63% were not concerned with any of these. Roseville streets are in much better shape than they were in 1991. According to Public Works Director Duane Schwartz many Roseville streets have been rebuilt in the past 15 years. Roseville roads typically last 20-30 years. Most residential streets in Roseville are designed for 7-ton maximum axle weight. The more heavy-duty arterial streets are designed for 9-ton maximum axle weight.

As part of the City's Pavement Management Fund, every four years, Roseville's 120 miles of streets are evaluated for their condition. This information is then used to determine a maintenance plan. The streets are also given a rating of 1 to 100. Above 65 means the street is in good shape. Between 35 and 65 means the street needs repairs. Below 35 means the street needs to be reconstructed. In 1985, 28 percent of Roseville streets were under a 35 rating. Now it is 1 percent. A survey a couple of years back showed that of comparable cities in the Metro area, Roseville had the highest rating for its streets.

Streets in Roseville are kept in good shape because of the City's innovative Street Infrastructure Repair Fund. Roseville set aside roughly $14 million available from pre-payment of bonds and other sources. Interest on this money is used for the Street Infrastructure Repair Fund that pays for various repair projects such as pavement patching. This keeps the cost for those projects off residents' property tax bills.

Roseville spends $600-700,000 a year on street repair and maintenance. Another $1.4 million comes from state aid. Another $700-800,000 comes from the Street Infrastructure Repair Fund.

Schwartz says our Pavement Management Plan and our Street Infrastructure Repair Funds are the envy of many cities throughout the country. He takes calls from other municipalities looking for details on how our programs work.

However Schwartz says Roseville streets could last an estimated five to ten years longer if garbage truck traffic was limited.

Garbage trucks put more wear and tear on streets than any other type of vehicle. According to the report "Effects of Heavy-Vehicle Characteristics on Pavement Response and Performance" from The University of Michigan Transportation Research Institute axle weight most directly determines damage to pavement and typical 3 axle garbage trucks have the highest axle weight of any vehicle traveling city streets approximately 20,000 lbs per front axle and a combined 44,000 lbs on the rear pair (see table on following page from the University of Michigan).

According to Schwartz there is a formula for calculating the different impacts of different vehicles. Pavement design manuals give the following load factor values to vehicle types:

—Car load factor = .0007
—Truck 18,000 lb/axle = 1.0
—Garbage truck can be as high as 1.6

The formula used by MnDOT says 1 garbage truck trip is equal to 1,000 car trips in terms of damage to pavement. Residential streets have average daily traffic counts of 200 to 500 vehicles.

TABLE 1. Truck metric sizes and weights

Truck Num.	Truck Configuration	Configuration Name	GCVW (Mgs)	Axle Loads (kips)	Wheelbases (feet)
1-2		2 Axle Straight Truck	33	12/20	13
3-4		3 Axle Straight Truck	46	12/34	18
5-8		3 Axle Refuse Hauler	54	20/44	17.5
9-12		4 Axle Concrete Mixer	68	18/50/32	20/32
13		3 Axle Tractor-Semitrailer	52	12/20/20	10/38
14-15		4 Axle Tractor-Semitrailer	66	12/20/34	12/36
16-20		5 Axle Tractor-Semitrailer	80	12/34/34	12/36
21		9 Axle Tractor-Semitrailer	98	14/53/33	10/36
22		5 Axle Trailer	80	12/34/34	12/36
23-24		6 Axle Trailer	85	12/34/39	12/38
25		5 Axle Doubles	80	10/18/17/18/17	10/22/22
26		5 Axle Doubles	80	10/20/15/20/15	10/22/22
27		7 Axle Doubles	120	12/34/34/20/20	12/38/22
28		9 Axle Doubles	140	12/32/32/32/32	12/38/38
29		Turnic Doubles	114	10/24/24/25/25	12/22/22

* Wheelbases to nearest common. Tandem spreads set at 52 inches.

(Table Courtesy of the University of Michigan Transportation Research Institute)

Schwartz devised a formula using these factors. He then factored in the life expectancy of a Roseville street and the cost per mile of reconstructing that road (approximately $500,000 to reconstruct one mile of 7-ton street). Using his calculations he said by limiting the number of garbage trucks on a Roseville street to approximately one hauler, it could extend the life of the street 5 to 10 years. And based on the assessment charged to a typical homeowner that could save the homeowner twenty to forty dollars a year.

The report from the University of Michigan also shows that repeated starting and stopping (especially stopping) will increase the damage to streets by 50% to 100% depending on the speed of the truck and the weight of the load being carried. Trucks with few stops on a block tend to be traveling faster when they begin stopping.

Alternative Systems

Cities such as Minneapolis that have municipal collection have been using city crews and trucks for many years. To start up a system of municipal collection would require a significant investment of money to purchase the trucks and hire the additional staff. That is why few if any Minnesota cities continue to use or are switching to municipal collection. That is also why the Committee chose not to consider municipal collection as an option.

However a number of cities are continuing to use or are switching to other forms of organized collection that use private haulers. Organized collection of waste is when a city arranges for collection services on behalf of residents. Cities do this for a number of reasons including lowering costs to residents, lessening truck traffic on city streets, designating a disposal facility for the garbage in order to meet environmental goals, setting enforceable customer service standards and expanding the number of services available to residents. Organized collection is cheaper for residents because haulers are able to save money with the more efficient system of collection and that savings is passed on to residents.

e-democracy

Trash Collection

From E-Democracy

Back To Home Page **of Citizens Guide to St. Paul**

Trash Collection

This is primarily an issue of public vs. private contracting. From time to time, someone in the St. Paul Issues Forum will complain about the inefficiency of the current private system, in which each homeowner contracts with a separate hauler. This results in many different haulers traversing the alleyways and streets of St. Paul each day. One large garbage truck traversing an alley once does as much damage as 1500 car trips down the same alley.

Arguments for private contracting:

- Better service and better prices (competition)
- Reduced opportunities for corruption
- More opportunities for small haulers to survive

Arguments for public coordination:

- More efficient. Fewer haulers in alleyways and less noise/pollution.
- Simpler for home owners
- Less damage to streets, alleys and boulevards

Alternative Proposals (to the current system):

- Neighborhood or district council coordination of local garbage contracts.
    1. Mandatory participation
    2. Voluntary participation
- One city-wide contract, renewed every 2-5 years
- Have the city collect the garbage
- Pay "by the pound"
- City Authorized Trash Bags
    1. Different Bags for different kinds of trash
    2. Fee for bags based on disposal/recycling costs
    3. Use of authorized bags mandatory

Solid Waste Management Coordinating Board[1] (http://www.swmcb.org/)

The Solid Waste Management Coordinating Board (http://www.swmcb.org/) (SWMCB), formed in 1990, is a joint powers board comprised of two commissioners from the counties of Anoka, Carver, Dakota, Hennepin, Ramsey and Washington, Minnesota. The Board develops plans for waste disposal in the metro area and also produces a number of reports and studies that are useful in researching waste disposal issues

Here are some interesting threads from the St. Paul Issues Forum on this topic:

Streets, alleyways and curbs (http://forums.e-democracy.org/topic/94402) - April 2006

Garbage Collection (http://forums.e-democracy.org/topic/51839) - June 2005

Privatization (http://www.mail-archive.com/stpaul@mnforum.org/msg03562.html) - August 2004

Retrieved from "http://www.e-democracy.org/wiki/Trash_Collection"

- This page was last modified 12:48, 26 April 2006.

E

Selected References from WSDOT Design Parameters Module 4

LEF Example

Assume a logging truck has three axles:

- Truck tractor
  - Steering axle (single axle) = 14,000 lb (62.2 kN)
  - Drive axle (tandem axle) = 34,000 lb (151.1 kN)
- Trailer
  - Pole trailer axle (tandem axle) = 30,000 lb (133.3 kN)

The total equivalent damage by this truck is (p_t = 3.0, SN = 3):

Steering axle @ 14,000 lb	=	0.47 ESAL
Drive axle @ 34,000 lb	=	1.15 ESAL
Pole axle @ 30,000 lb	=	0.79 ESAL
Total	=	2.41 ESAL

If a pavement is subjected to 100 of these trucks each day (in one direction) for 20 years (5 days per week), the total ESAL for this truck would be:

(5 day/7 day)(365 days/year)(20 years)(100 trucks/day) (2.41 ESAL/truck) = 1,256,643 ESAL

Loads

Loads are the vehicle forces exerted on the pavement (e.g., by trucks, heavy machinery, airplanes). Since on of the primary functions of a pavement is load distribution, pavement design must account for expected lifetime traffic loading. Loads can be characterized by tire loads, axle and tire configurations, load repetition, traffic distribution across the pavement and vehicle speed.

Figure 1: H-1 During Rush Hour

Figure 2: Buses at Ala Moana

Load Characterization

- *Tire Loads*. Tire loads are the fundamental loads at the actual tire-pavement contact points.
- *Axle and tire configurations*. While the tire contact pressure and area is of concern, the number of contact points per vehicle and their spacing is critical. As tire loads get closer together their influence areas on the pavement begin to overlap, at which point the design characteristic of concern is no longe the single isolated tire load but rather the combined effect of all the interacting tire loads.
- *Load repetition*. Loads, along with the environment, damage pavement over time. The standard model asserts that each individual load inflicts a certain amount of unrecoverable damage. This damage is cumulative over the life of the pavement and when it reaches some maximum value the pavement is considered to have reached the end of its useful service life.
- *Traffic distribution*. On any given road, one direction may carry more loads than the other. Furthermor within this one direction, each lane may carry a different portion of the loading. The outer most lane often carries the most trucks and therefore is usually subjected to the heaviest loading.

- *Vehicle speed*. In general, slower speeds and stop conditions allow a particular load to be applied to a given pavement area for a longer period of time resulting in greater damage. If mix design or structural design have been inadequate, this behavior is sometimes evident at bus stops (where heavy buses sto and sit while loading/unloading passengers) and intersection approaches (where traffic stops and waits to pass through the intersection).

Load Quantification

Pavement structural design requires a quantification of all expected loads a pavement will encounter over its design life. This quantification can be done in several ways:

- *Equivalent single axle loads (ESALs)*. This approach converts wheel loads of various magnitudes and repetitions ("mixed traffic") to an equivalent number of "standard" or "equivalent" loads based on the amount of damage they do to the pavement. The commonly used standard load is the 18,000 lb. equivalent single axle load. Using the ESAL method, all loads (including multi-axle loads) are converte to an equivalent number of 18,000 lb. single axle loads, which is then used for design. A "load equivalency factor" represents the equivalent number of ESALs for the given weight-axle combination. a rule-of-thumb, the load equivalency of a particular load (and also the pavement damage imparted b particular load) is roughly related to the load by a power of four (for reasonably strong pavement surfaces). For example, a 36,000 lb. single axle load will cause about 16 times the damage as an 18,0 lb. single axle load. Table 1 shows some typical load equivalencies (note that spreading a load out ove two closely spaced axles reduces the number of ESALs). Figure 3, using some approximations, shows some general vehicle load equivalencies - note that buses tend have high load equivalency factors because although they may be lighter than a loaded 18-wheeler, they only have two or three axles instead of five.

Load	Number of ESALs
18,000 lb. single axle	1.000
2,000 lb. single axle	0.0003
30,000 lb. single axle	7.9
18,000 lb. tandem axle	0.109
40,000 lb. tandem axle	2.06

FLEXIBLE PAVEMENT SAME AS STATED IN WSDOT EXAMPLE

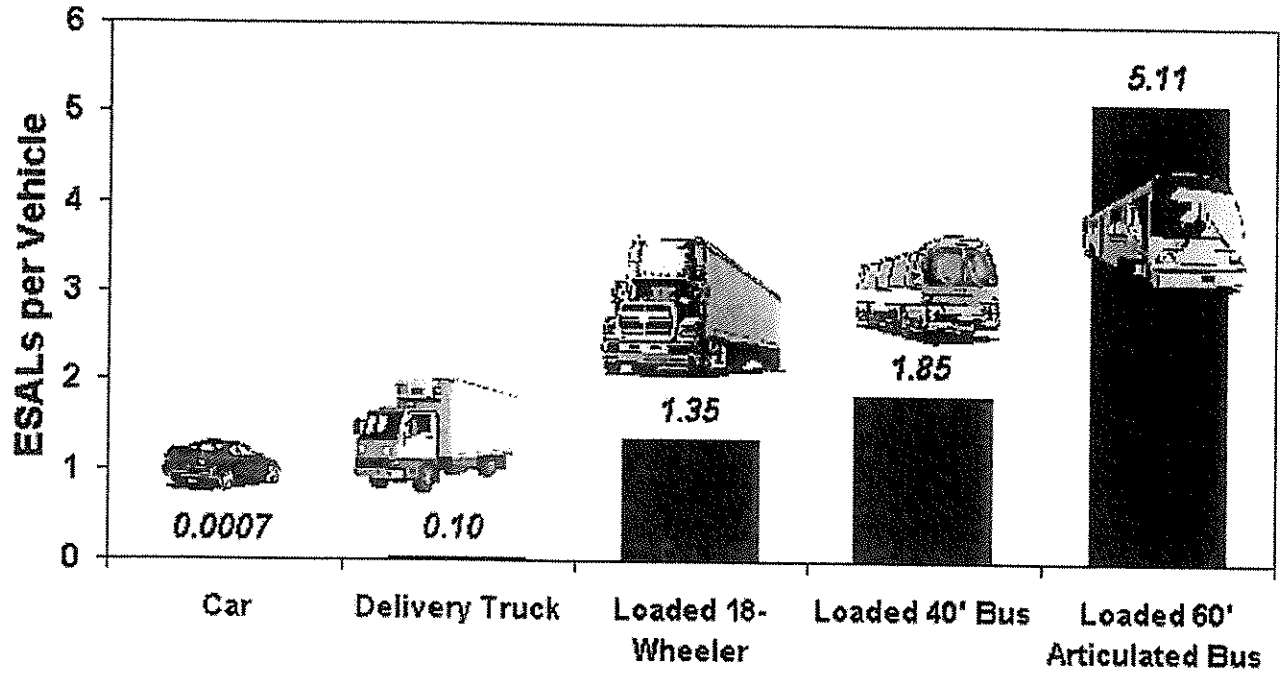


Figure 3: Some Typical Load Equivalency Factors

- *Traffic Index* (TI). The traffic index is associated with the California method of pavement structural design. Essentially, it has evolved in to a way of expressing ESALs as a single number or index (see Figure 4).

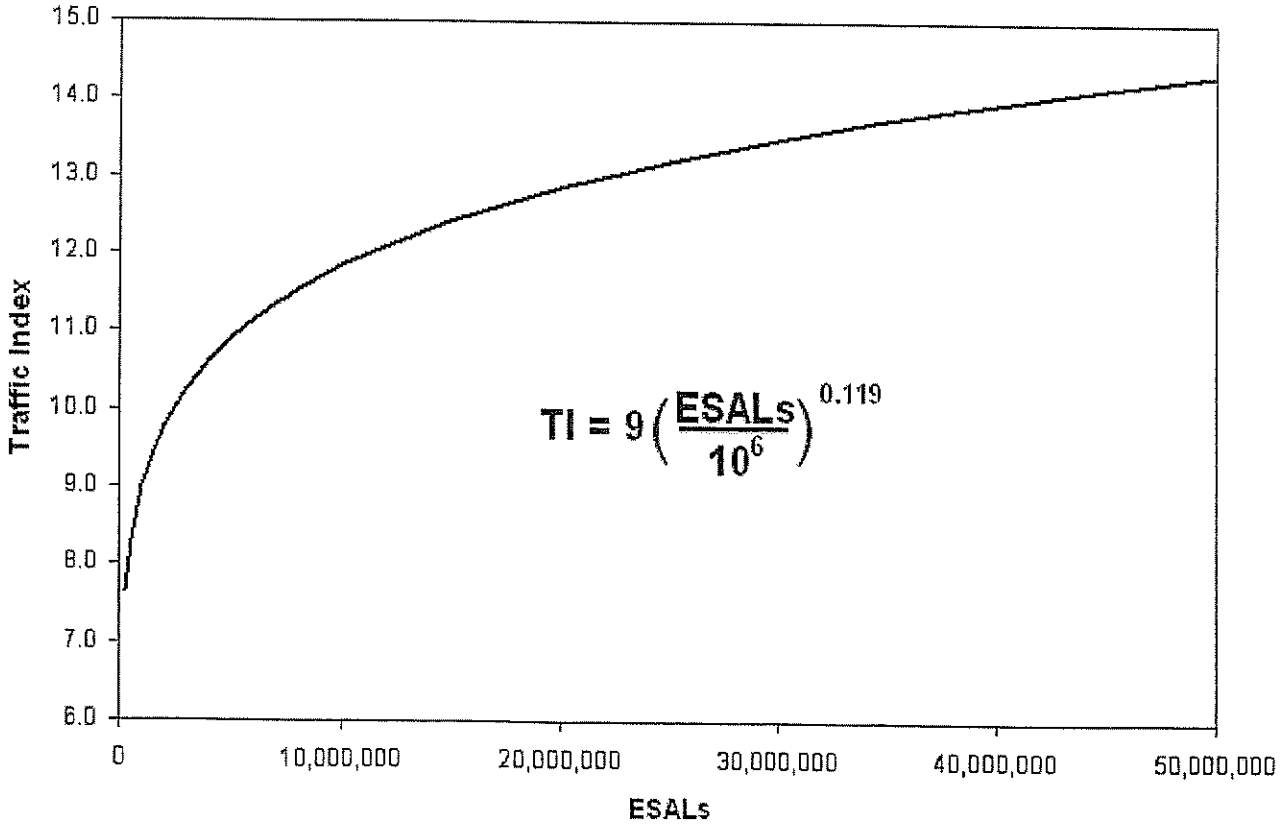


Figure 4: Traffic Index vs. ESALs

- *Load spectra*. This approach characterizes loads directly by number of axles, configuration and weight. does not involve conversion to equivalent values. Structural design calculations using load spectra are generally more complex than those using a traffic index or ESALs because loading cannot be reduced t one equivalent number. Load spectra will be an option for use in the next AASHTO *Design Guide*.

All approaches use the same type and quality of data but the load spectra approach has the potential to be more accurate in its load characterization.

Table 4.5: Some Typical Load Equivalency Factors				
Axle Type (lbs)	**Axle Load**		**Load Equivalency Factor (from AASHTO, 1993)**	
	(kN)	**(lbs)**	**ie AC Flexible**	**ie Concrete Rigid**
Single axle	8.9	2,000	0.0003	0.0002
	44.5	10,000	0.118	0.082
	62.3	14,000	0.399	0.341
	80	18,000	1	1
	89	20,000	1.4	1.57
	133.4	30,000	7.9	8.28
Tandem axle	8.9	2,000	0.0001	0.0001
	44.5	10,000	0.011	0.013
	62.3	14,000	0.042	0.048
	80	18,000	0.109	0.133
	89	20,000	0.162	0.206
	133.4	30,000	0.703	1.14
	151.2	34,000	1.11	1.92
	177.9	40,000	2.06	3.74
	222.4	50,000	5.03	9.07

Assumptions:

pt = 2.5

Pavement structural number (SN) = 3.0 for flexible pavements

Slab depth (D) = 9.0 inches for rigid pavements

From the WSDOT Pavement Design Guide

General Observations Based On Load Equivalency Factors

1. The relationship between axle weight and inflicted pavement damage is not linear but exponential. For instance, a 44.4 kN (10,000 lbs) single axle needs to be applied to a pavement structure **more than 12 times** to inflict the same damage caused by one repetition of an 80 kN (18,000 lbs) single axle. Similarly, a 97.8 kN (22,000 lbs) single axle needs to be repeated less than half the number of times of an 80 kN (18,000 lbs) single axle to have an equivalent effect.
    - An 80 kN (18,000 lbs) single axle does **over 3,000 times more damage** to a pavement than an 8.9 kN (2,000 lbs) single axle (1.000/0.0003 ≈ 3,333).
    - A 133.3 kN (30,000 lbs) single axle does about **67 times more damage** than a 44.4 kN (10,000 lbs) single axle (7.9/0.118 ≈ 67).
    - A 133.3 kN (30,000 lb) single axle does about **11 times more damage** than a 133.3 kN (30,000 lb) tandem axle (7.9/0.703 ≈ 11).
    - Heavy trucks and buses are responsible for a majority of pavement damage. Considering that a typical automobile weighs between 2,000 and 7,000 lbs (curb weight), even a fully loaded large passenger van will only generate about 0.003 ESALs while a fully loaded tractor-semi trailer can generate up to about 3 ESALs (depending upon pavement type, structure and terminal serviceability).

Definition of ESAL

Equivalent single axle loads (ESALs). This approach converts wheel loads of various magnitudes and repetitions ("mixed traffic") to an equivalent number of "standard" or "equivalent" loads.

Garbage Truck loading

Steering	18,000 lbs
Drive	34,000 + 8,000 = 42,000 lbs

TABLE 4.5

ESAL	
1.0	
2.06	(for 40,000 lbs)
3.06	Total ESAL

iif using fully loaded Van = 0.003 ESAL

∴ From Table

$\frac{3.06}{0.003}$ = 1020 EQUIVALENT Loads

or

1 truck = 1020 vehicles

Flexible Pavement ESAL Equation

At first glance, this equation looks quite complex - it is. I agree

$$\frac{W_x}{W_{18}} = \left[\frac{L_{18} + L_{2s}}{L_x + L_{2x}}\right]^{4.79}\left[\frac{10^{G/\beta_x}}{10^{G/\beta_{18}}}\right][L_{2x}]^{4.33}$$

Where: W = axle applications inverse of equivalency factors (where W_{18} = number of 18,000 lb (80 kN) single axle loads)

L_x = axle load being evaluated (kips)

L_{18} = 18 (standard axle load in kips)

L_2 = code for axle configuration

1 = single axle
2 = tandem axle
3 = triple axle (added in the 1986 AASHTO *Guide*)
x = axle load equivalency factor being evaluated
s = code for standard axle = 1 (single axle)

G = $\log\left(\frac{4.2 - p_t}{4.2 - 1.5}\right)$ a function of the ratio of loss in serviceability at time, t, to the potential loss taken at a point where $p_t = 1.5$

p_t = "terminal" serviceability index (point at which the pavement is considered to be at the end of its useful life)

$\beta = 0.4 + \left(\frac{0.081(L_x + L_{2x})^{3.23}}{(SN+1)^{5.19} L_{2x}^{3.23}}\right)$ function which determines the relationship between serviceability and axle load applications

SN = structural number

Example Calculation for a Single Axle

- Assumptions: Single axle, 30,000 lb (133 kN), SN = 3, p_t = 2.5
- Answer: (Table D.4, p. D-6, 1993 AASHTO *Guide*) = 7.9
- Calculations

$$\frac{W_{30}}{W_{18}} = \left[\frac{18+1}{L_{30}+L_{2x}}\right]^{4.79}\left[\frac{10^{G/\beta_{30}}}{10^{G/\beta_{18}}}\right][L_{2x}]^{4.33}$$

where :

W_{18} = predicted number of 18,000 lb (80 kN) single axle load applications,

W_{30} = predicted number of 30,000 lb (133 kN) single axle load applications,

L_x = L_{30} = 30

L_{2x} = 1 (single axle)

G = serviceability loss factor

$$= \log\left(\frac{4.2-2.5}{4.2-1.5}\right) = -0.2009$$

β_{30} = curve slope factor

$$= 0.4 + \left(\frac{0.081(30+1)^{3.23}}{(3+1)^{5.19}(1)^{3.23}}\right) = 4.388$$

and G/β_{30} = -0.2009/4.388 = -0.04578

$$\beta_{18} = 0.4 + \left(\frac{0.081(18+1)^{3.23}}{(3+1)^{5.19}(1)^{3.23}}\right) = 1.2204$$

G/β_{18} = -0.2009/1.2204 = -0.1646

Thus,
$$\frac{W_{30}}{W_{18}} = \left[\frac{18+1}{30+1}\right]^{4.79}\left[\frac{10^{-0.04578}}{10^{-0.1646}}\right][1]^{4.33} = 0.1260$$

and $\frac{W_{30}}{W_{18}} \cong 12.6\%$ of W_{18} loads allowable with a 30,000 lb. single axle

Finally, LEF = $\frac{1}{0.1260} = 7.9365 \cong 7.9$

(same as contained in 1993 AASHTO *Guide* — Appendix D)

The "Look up" tables

Example Calculation for a Tandem Axle

- Assumptions: Tandem axle, 40,000 lb (133 kN), SN = 5, p_t = 2.5
- Answer: (Table D.5, p. D-7, 1993 AASHTO *Guide*) = 2.08
- Calculations

$$\frac{W_{40}}{W_{18s}} = \left[\frac{L_{18} + L_{2s}}{L_{40} + L_{2x}}\right]^{4.79}\left[\frac{10^{G/\beta_{40}}}{10^{G/\beta_{18}}}\right][L_{2x}]^{4.33}$$

where :

L_{40} = 40 (tandem axle)

L_{18} = 18 (single axle)

L_{2x} = 2 (tandem axle)

L_{2s} = 1 (single axle)

G = serviceability loss factor

$$= \log\left(\frac{4.2-2.5}{4.2-1.5}\right) = -0.2009$$

β_{40} = curve slope factor

$$= 0.4 + \left(\frac{0.081(40+2)^{3.23}}{(5+1)^{5.19}(2)^{3.23}}\right) = 0.53824$$

and G/β_{40} = -0.2009/0.53824 = -0.37325

$$\beta_{18} = 0.4 + \left(\frac{0.081(18+1)^{3.23}}{(5+1)^{5.19}(1)^{3.23}}\right) = 0.50006$$

G/β_{18} = -0.2009/0.50006 = -0.40175

Thus,
$$\frac{W_{40}}{W_{18}} = \left[\frac{18+1}{40+2}\right]^{4.79}\left[\frac{10^{-0.37325}}{10-0.40175}\right][2]^{4.33} = 0.48064$$

Finally, LEF = $\dfrac{1}{0.48064} = 2.08$

(same as contained in 1993 AASHTO *Guide* — Appendix D)

LOAD EQUIVALENCY FACTOR

3.2.2 Typical Axle Load Limits

Federal and State laws establish maximum axle and gross vehicle weights to limit pavement damage. The range of weight limits in the U.S. vary a bit based on various Federal and State laws. Figure 4.17 shows the range of maximum limits for single axle, tandem axle and gross vehicle weight (GVW) established by the states and the FHWA.

Washington State Tire and Axle load limits

Single Axle 20,000 Lbs

Tandem Axle 34,000 Lbs

From the WSDOT Pavement Guide

THIS APPROXIMATES THE MORE COMPLEX FORMULA

3.6.1 Generalized Fourth Power Law

The AASHTO load equivalency equation is quite cumbersome and certainly not easy to remember. Therefore, as a rule-of-thumb, the damage caused by a particular load is roughly related to the load by a power of four (for reasonably strong pavement surfaces). For example, given a flexible pavement with SN = 3.0 and $p_t = 2.5$:

1. A 18,000 lb (80 kN) single axle, LEF =1.0
2. A 30,000 lb (133 kN) single axle, LEF = 7.9
3. Comparing the two, the ratio is: 7.9/1.0 = 7.9
4. Using the fourth power rule-of-thumb:

$$\left(\frac{30{,}000\ lb}{18{,}000\ lb}\right)^4 = 7.7$$

Thus, the two estimates are approximately equal.

Assume standard vehicle @ 2,500 # axle and compute LEF

(2,500 / 18,000) 4th power = 0.00037

Assume tandem axle @ 42,000# and compute LEF

LEF approximated from chart

(42,000 / 40,000) 4th power = 1.22

2.06 LEF @ 40,000# = 2.50 LEF adjusted for 42,000#

The ratio of the standard axle @ 2,500# to the tandem truck axle is 2.50 / .00037 = 6,756 times

Assume a 3,500 # axle

(3,500 / 18,000) 4th power = 0.0014

The ratio of the standard axle @ 3,500# to the tandem truck axle is 2.5 / 0.0014 = 2,500 times

FROM THE WSDOT PAVEMENT GUIDE

General Observations Based On Load Equivalency Factors

1. The relationship between axle weight and inflicted pavement damage is not linear but exponential. For instance, a 44.4 kN (10,000 lbs) single axle needs to be applied to a pavement structure **more than 12 times** to inflict the same damage caused by one repetition of an 80 kN (18,000 lbs) single axle. Similarly, a 97.8 kN (22,000 lbs) single axle needs to be repeated less than half the number of times of an 80 kN (18,000 lbs) single axle to have an equivalent effect.
    - An 80 kN (18,000 lbs) single axle does **over 3,000 times more damage** to a pavement than an 8.9 kN (2,000 lbs) single axle (1.000/0.0003 ≈ 3,333).
    - A 133.3 kN (30,000 lbs) single axle does about **67 times more damage** than a 44.4 kN (10,000 lbs) single axle (7.9/0.118 ≈ 67).
    - A 133.3 kN (30,000 lb) single axle does about **11 times more damage** than a 133.3 kN (30,000 lb) tandem axle (7.9/0.703 ≈ 11).
    - Heavy trucks and buses are responsible for a majority of pavement damage. Considering that a typical automobile weighs between 2,000 and 7,000 lbs (curb weight), even a fully loaded large passenger van will only generate about 0.003 ESALs while a fully loaded tractor-semi trailer can generate up to about 3 ESALs (depending upon pavement type, structure and terminal serviceability).

F

Equivalent Single Axle Loads (ESAL's) Calculations using WSDOT Design Parameters

From the WSDOT Pavement Guide

3.6.1 Generalized Fourth Power Law

The AASHTO load equivalency equation is quite cumbersome and certainly not easy to remember. Therefore, as a rule-of-thumb, the damage caused by a particular load is roughly related to the load by a power of four (for reasonably strong pavement surfaces). For example, given a flexible pavement with SN = 3.0 and $p_t = 2.5$:

1. A 18,000 lb (80 kN) single axle, LEF =1.0
2. A 30,000 lb (133 kN) single axle, LEF = 7.9
3. Comparing the two, the ratio is: 7.9/1.0 = 7.9
4. Using the fourth power rule-of-thumb:

$$\left(\frac{30{,}000\ lb}{18{,}000\ lb}\right)^4 = 7.7$$

Thus, the two estimates are approximately equal.

Following are computations specific for the City of Kelso and Waste Control trucks.

Assume standard vehicle @ 2,500 # axle and compute LEF

(2,500 / 18,000) 4th power = 0.00037. There are two axles = 0.00074

Assume tandem axle @ 42,000 # and compute LEF

(42,000 / 40,000) 4th power = 1.22

2.06 LEF @ 40,000 # = 2.50 LEF adjusted for 42,000 #

Add 1.00 LEF for the 18,000" front axle = 3.5 LEF for the truck

The pavement damage ratio of the Waste Control truck to the standard 5,000 # vehicle is:

3.50 / .00074 = 4,730 times

Jerry Sorrell

From: Jerry Sorrell [jerry.sorrell@kelso.gov]
Sent: Monday, July 17, 2006 4:20 PM
To: Brooks, Bob
Subject: RE: Equivalent Axle Loads on Kelso City Streets

Thank you for your help on this.

-----Original Message-----
From: Brooks, Bob [mailto:BrookBo@wsdot.wa.gov]
Sent: Monday, July 17, 2006 1:52 PM
To: jerry.sorrell@kelso.gov
Subject: RE: Equivalent Axle Loads on Kelso City Streets

Hi Jerry

According to the WSDOT Pavement Guide the Load Equivalency Factors are as follows:

Passenger Car @ 2000 lbs per axel = 0.0003 LEF per axle x 2 axles = 0.0006

Garbage Truck @ 18000 lbs front axle = 1.000 LEF
Garbage truck @ 40000 lbs tandem axle = 2.06 LEF
Garbage Truck total = 1.00 + 2.06 = 3.06 LEF

If you divide 3.06/.0006 = 5100 So 1 garbage truck does as much damage as 5100 cars. These calculation are for flexible pavement only and would change for rigid pavement. This can be found in Module 4, chapter 3.6 of the WSDOT Pavement Guide.

Bob Brooks
360-705-7352
brookbo@wsdot.wa.gov

-----Original Message-----
From: Jerry Sorrell [mailto:jerry.sorrell@kelso.gov]
Sent: Monday, July 17, 2006 1:07 PM
To: Brooks, Bob
Cc: Hash, Ken; David Sypher
Subject: Equivalent Axle Loads on Kelso City Streets

Hello Bob,

Could you give us some guidance on determining the Load Equivalency Factor for these vehicles?

Passenger car at 2,500# per axle

Three axle garbage trucks with 18,000# front axle and 42,000# on the tandem axle. Assume the load is split on the tandem.

I have looked through the WSDOT pavement Guide on the internet, but some equation work is necessary to get the load equivalency factor..

What we are really looking for is: How much more pavement damage will one garbage truck cause as compared to one passenger car, with the axle loads shown?

Jerry Sorrell City of Kelso 360-423-6590

G

Table 2-1 From "Residential Streets" pg 16 Developed by ULI, NAHB, ASCE and ITE

TABLE 2-1

STREET FUNCTION AND AVERAGE DAILY TRAFFIC (ADT) RANGES

	ADT Range	Dwellings Served[1]
Local Streets	400-1,500	40-150
Residential Collector	>1,500	>150

[1]Based on single-family detached houses, at ten daily trips per dwelling unit.

brief delays and accept the need to decrease speed. In fact, it is customary for responsible individuals to drive carefully to avoid children and pets.

Average daily traffic (ADT), the total number of vehicles traveling in both directions past a point on a typical day, can help guide the choice of street type. The number of dwelling units served by the street (that is, using it as the preferred route) is another factor that can help guide the choice of streets. Usual ADT and number of dwelling units served by different classes of streets are presented in Table 2-1. The ADT range and housing units served for different classes of streets may overlap, and thus are not intended to serve as absolute design criteria.

The traffic density and speed found on highways, arterials, and collector streets are absent from local streets, and driving attitudes and habits on local streets differ from driving behaviors on highways, arterials, and collector streets. Yielding momentarily to resolve minor traffic conflicts is practical at the speeds observed in residential areas. In residential areas, traffic yields to drivers backing from their driveways or drivers coming out of their driveways yield to oncoming traffic, and no one is unduly delayed. If parked vehicles impede residential traffic, approaching vehicles often yield and then proceed with caution. Street design that encourages this kind of cautious driver behavior can result in reduced speeds and more attentive drivers, and thus make streets safer.

The primary considerations in selecting guidelines for residential streets, therefore, are the characteristics of local residential traffic and the expectations of residents. Traffic volumes can provide additional guidance for decision making.

TABLE 2-2

RESIDENTIAL TRIP GENERATION RATES

	Vehicle Trips per Dwelling Unit	
	Weekday	Peak Hour
Detached Single-Family Units	9.6	1.00
Apartment Units		
• All Apartments	6.6	0.67
• Low-Rise Apartments	6.6	0.62
• High-Rise Apartments	4.2	0.40
Townhouse and Condominium Units	5.9	0.54

Source: Institute of Traffic Engineers, *Trip Generation Handbook*, Sixth Edition (Washington, D.C.: ITE, 1997).

H

City of Kelso Local Residential Street Traffic Counts (w/summary)

Traffic Count

Count Street	From	To	Maximum Traffic Day of Wk	City Region	Maximum ADT
Maple	S Pacific	3rd	Thursday	Central	224
Crawford	N Pacific	3rd	Tuesday	Central	510
N 1st	Donation	N Pacific	Friday	Central	1179
Cowlitz Way	7th	8th	Friday	Central	1205
Lewis	3rd	4th	Friday	North	86
Division	N Pacific	1st	Saturday	North	197
Elm	7th	8th	Thusday	South	424
Coweeman	8th	11th	Friday	South	97
W 4th	Catlin	Washington	Wednesday	West	278
NW 2nd	Bydan Ln	Galloway	Friday	West	432
NW 5th	Clarke	Fisher	Friday	West	286
Burcham	23rd	Sunrise	Friday	North East	476
Behshel	Tara	Sunrise	Saturday	North East	464
N 19th	Allen	Bates	Wednesday	East	960
Cedar Falls Drive	Kelso Dr	Ruby Place	Monday	East	115
Meadow Lark Lane	Allen	Dove Lane	Monday	East	355
Kelso Average residential ADT					**456**

Dates Count Done:
October. 6, 13, 20, 27, November 3 2006
February 15, 2007

I

Selected Design Standards from the Jurisdictions of Kirkland, Pierce County, Maple Valley and Poulsbo

CITY OF KIRKLAND
123 FIFTH AVENUE KIRKLAND, WASHINGTON 98033-6189 (206) 828-1243

DEPARTMENT OF PUBLIC WORKS
MEMORANDUM

To: City of Kirkland Standard Plans, Policy Section

From: Gary Sund, City Engineer

Date: April 28, 1993

Subject: **ENGINEERING PLAN REQUIREMENTS**

All subdivision, multi-family and commercial projects which submit for grading or building permit must include engineering drawings which have been stamped, signed and dated by a professional engineer licensed in the State of Washington. The plans must also include all of the applicable requirements outlined below:

GENERAL PLAN FORMAT:

1. Plan sheets and profile sheets or combined plan and profile sheets, specifications and detail sheets shall be on sheet size 24" x 36".

2. The detail sheet(s) shall include all standard details which are applicable to the project plus any details which are unique to the project. The detail sheet(s) shall provide sufficient information to construct complex elements of the project. Details may be provided on the plan and profile sheets if space allows.

3. Each submittal shall contain a project information / cover sheet with the following information:

   a. Title: Project name and City of Kirkland file number.
   b. Table of contents (if more than three pages).
   c. Vicinity map.
   d. Legal description.
   e. Name and phone number of utility field contacts and One-Call number, 1-800-424-5555.
   f. Name and phone number of surveyor.
   g. Name and phone number of owner/agent.
   h. Name and phone number of applicant.
   i. Name and phone number of engineering firm preparing plans (company logos acceptable).
   j. City of Kirkland's preconstruction notification requirements.
   k. City of Kirkland Public Works inspection request line phone number, 828-2224.

4. A title block shall be provided on each plan sheet. The title block shall list at a minimum the development title, the name, address, and phone number of the firm or individual preparing the plan, a revision block, date, page (of pages) numbering, and sheet title (e.g. Road and Drainage, Grading, Erosion/Sedimentation Control).

Roadway Geometric Design Criteria

Street Designation	Principle Arterial	Minor Arterial	Non–Residential Collector	Residential Collector	Local Streets
ADT	>20,000	8,000 – 20,000	2,500 – 8,000	1,200 – 3,500	<1,500
Criteria					
Design Speed (MPH) (2)					
Flat	60	55	50	35	30
Rolling (6)	50	45	40	35	30
Mountainous	40	35	35	25	25
Min. Radius (ft)					(5)
Flat	1,200	960	760	380	273
Rolling (6)	760	600	465	380	273
Mountainous	465	410	350	185	185
Max. Grade (%) (3)					
Flat	6	6	7	7	8
Rolling (6)	7	8	10	10	12
Mountainous	9	10	12	12	15
Std. Stopping Sight Dist.					
Flat	650	550	475	250	200
Rolling (6)	475	400	325	250	200
Mountainous	325	250	225	150	150
Std. Entering Sight Dist.					
Flat	810	750	685	490	
Rolling (6)	685	620	555	490	(4)
Mountainous	555	490	490	365	
Max. Superelevation (ft/ft)	0.08	0.08	0.08	0.06	–
Min. Pavement Width (ft)	(1)	44	36	36	28
Min R.O.W. Width (ft)	(1)	80	60	60	50

Notes:

1. Width to be determined by the Public Works Director.
2. Design speed is a basis for determining geometric elements and does not imply legally permissible speed.
3. Maximum grade may be exceeded for short distances subject to approval by the City Engineer. Such approval shall be conditioned upon the following:
   A. No practical alternative exists.
   B. Grades over 15% meet Fire Department Approval.
   C. Any grade over 15% up to a max. of 20% shall extend no further than 600 ft. without being interrupted by an intersection or landing with a max. 8 ft. difference in elevation over a distance of 100 ft.
4. Standard Entering Sight Distance shall not apply on Local Streets.
5. Low speed curve min. 100' centerline radius with approval of City Engineer.
6. Terrain classification is as follows:
   A. FLAT terrain is that condition where road sight distances, as governed by both horizontal and vertical restrictions, are generally long or could be made to be so without construction difficulty or major expense.
   B. ROLLING terrain is that condition where the natural slopes consistently rise above and fall below the road grade line and where occasional steep slopes offer some restriction to normal road horizontal and vertical alignment
   C. MOUNTAINOUS terrain is that condition where longitudinal and transverse changes in the elevation of the ground with respect to a road are abrupt and where the roadbed is obtained by frequent benching or side hill excavation.

Manual
on
Design Guidelines and Specifications for Road and Bridge Construction
in
Pierce County

Pierce County
Department of Public Works and Utilities
Transportation Services

Office of County Engineer
2401 South 35th Street, Room 150
Tacoma, WA 98409-7485
(253) 798-7250 (Phone)
(253) 798-2740 (FAX)

Other Telephone Numbers:

Engineering Division	(253) 798-7250
Right-of-Way Section	(253) 798-7250
Road Maintenance Division	(253) 798-7364
Traffic Operations Center	(253) 798-3669
Department of Planning and Land Services (PALS)	(253) 798-2785
Clerk of the County Council	(253) 798-7579

Chapter 2

Design Control

2-1 Functional Classification

The first step in the design process is to identify the functional classification of the roadway. The functional classification of existing Pierce County roadways are established by ordinance by the Pierce County Council and are identified in Chapter 12.08, Pierce County Code. A narrative of the existing and future adjacent land use and environment must accompany the proposal for functional classifications of new facilities. This narrative should answer questions such as: Is the roadway in an urban environment? Are schools or parks nearby? What is the expected pedestrian and bicycle activity? Will the roadway serve an industrial or commercial site?

Existing and future traffic volumes must be documented. The estimated future traffic volumes serve as the design year for the roadway. Interim designs are based on a 5- or 10-year traffic study. All interim designs must contribute to the 20-year roadway design.

2-1.1 Functional Classification System. Roads and highways are most effectively classified by their function, according to the character of service they are intended to provide. The primary functions of roads and highways are to provide mobility and to provide access, and the degree to which these functions are provided is considered an integral part of classifying roads. The functional classification system creates a hierarchy of classified roads.

For example, a freeway provides a high degree of mobility but very limited access, which is available only at interchanges that could be spaced several miles apart. Higher vehicle speeds and volumes are typical on these types of facilities and are, in fact, desirable. On the other hand, a local road within a residential neighborhood provides a high degree of access by way of numerous driveways to adjacent lots, and lower vehicle speeds and volumes are desired. Between these two extremes are the remainder of the roads, commonly called the arterial system, that must provide both mobility and access.

Roads are grouped into a number of different classifications for administrative, planning, and design purposes. For example, the classification system can be used for planning for new routes, improvements to existing roads, and planning for area development in concert with the transportation network and providing minimum design standards or criteria to encourage the use of the road as intended.

The main considerations for classifying roads into functional groups are the travel desires of the public, land service needs based on existing and expected land use, and the overall continuity of the system. A classification plan which fits the various classes of roads together into a logical pattern and assigns realistic improvement standards to each class will promote the highest overall level of service for the funds that are available.

Pierce County definitions for each functional classification are presented below. The Pierce County Transportation Plan includes transportation plans for modes other than passenger vehicles. These modal plans are intended to overlay onto the functional classification system. For example, the bicycle plan would overlay the functional classification system to identify those roadways that should include bicycle facilities as a design element of the roadway.

The Pierce County functional classification system directly addresses all roads in unincorporated Pierce County that are under the jurisdiction of Pierce County. State highways under the jurisdiction of the Washington State Department of Transportation are all legally designated arterials (RCW 46.61.195). In some cases, particularly in rural areas of the County, no major County arterials are designated since this function is served by the state highway route.

2-1.2 Functional Classification Definitions

2-1.2.1 Major Arterials. Major arterials provide service for major traffic movements within the County. They serve major centers of activity; intra-area travel between suburban centers, between larger communities, and between major trip generators. Major arterials serve the longest trips and carry the major portion of trips entering and leaving the overall area. Typically they are one of the highest traffic volume corridors in the County. The design year ADT is approximately 5,000 to 30,000 vehicles per day or more. They frequently carry important intra-urban and inter-city bus routes.

The spacing of major arterials usually varies from about 1 mile in highly developed business areas to 5 miles or more in rural areas. Service to abutting land should be subordinate to the provision of travel service to major traffic movements; this service should be incidental to the primary functional responsibility of the road. Desirably it is located on community and neighborhood boundaries or adjacent to but not through major shopping centers, parks, and other homogeneous areas.

2-1.2.2 Secondary Arterials Secondary arterials interconnect with and augment the major arterial system. Secondary arterials connect major arterials to collector arterials and small generators. They provide service to medium-size trip generators, such as less intensive commercial development, high schools and some junior high/grade schools, warehousing areas, active parks and ballfields, and other land uses with similar trip generation potential. They distribute travel to smaller geographic areas and communities than those identified with the major arterial system. They provide service to trips of moderate length of a somewhat lower level of travel mobility than major arterials. The design year ADT is approximately 2,500 to 15,000 vehicles per day.

Spacing of secondary arterials usually varies from less than 1 mile in fully developed areas to about 3 miles or more in rural areas. They provide intra-community continuity and are typically a continuous road with a direct rather than a meandering alignment. They may carry local bus routes.

Secondary arterials allow for more emphasis on land access than the major arterial system. They usually do not penetrate identifiable neighborhoods.

2-1.2.3 Collector Arterials Collector arterials distribute trips from major and secondary arterials to the ultimate destination, or may collect traffic from local roads and channel it into the major and secondary arterials systems. They carry a low proportion of traffic traveling through the entire subarea; carry a high proportion of local traffic with an origin or destination within that area. The design year ADT is approximately 1,000 to 4,000 vehicles per day. They may be on a somewhat meandering alignment and need not be particularly long or continuous.

Spacing ranges from 1/4 mile in developed areas to 3 miles in rural areas. Collector arterials provide both land access service and traffic circulation within residential neighborhoods, commercial, and industrial areas. They may penetrate identifiable residential neighborhoods.

2-1.2.4 Local Road System The local road system provides circulation and access for residential neighborhoods away from the arterial system. The local road system consists of the Local Road Feeder, Local Road Minor, and Local Road Cul-de-sac. Figure 2-1 presents conceptual example of each local road classification as a local road system.

For developments or neighborhoods of moderate size or larger, the roads serving as primary access to and from the bordering arterial system should be considered for local road feeder classification with no direct lot access and abutting residences oriented away from it. Traffic generators, such as schools or churches, within residential areas should be considered within the local circulation pattern, not only from within the subdivision, but from adjacent neighborhoods as well.

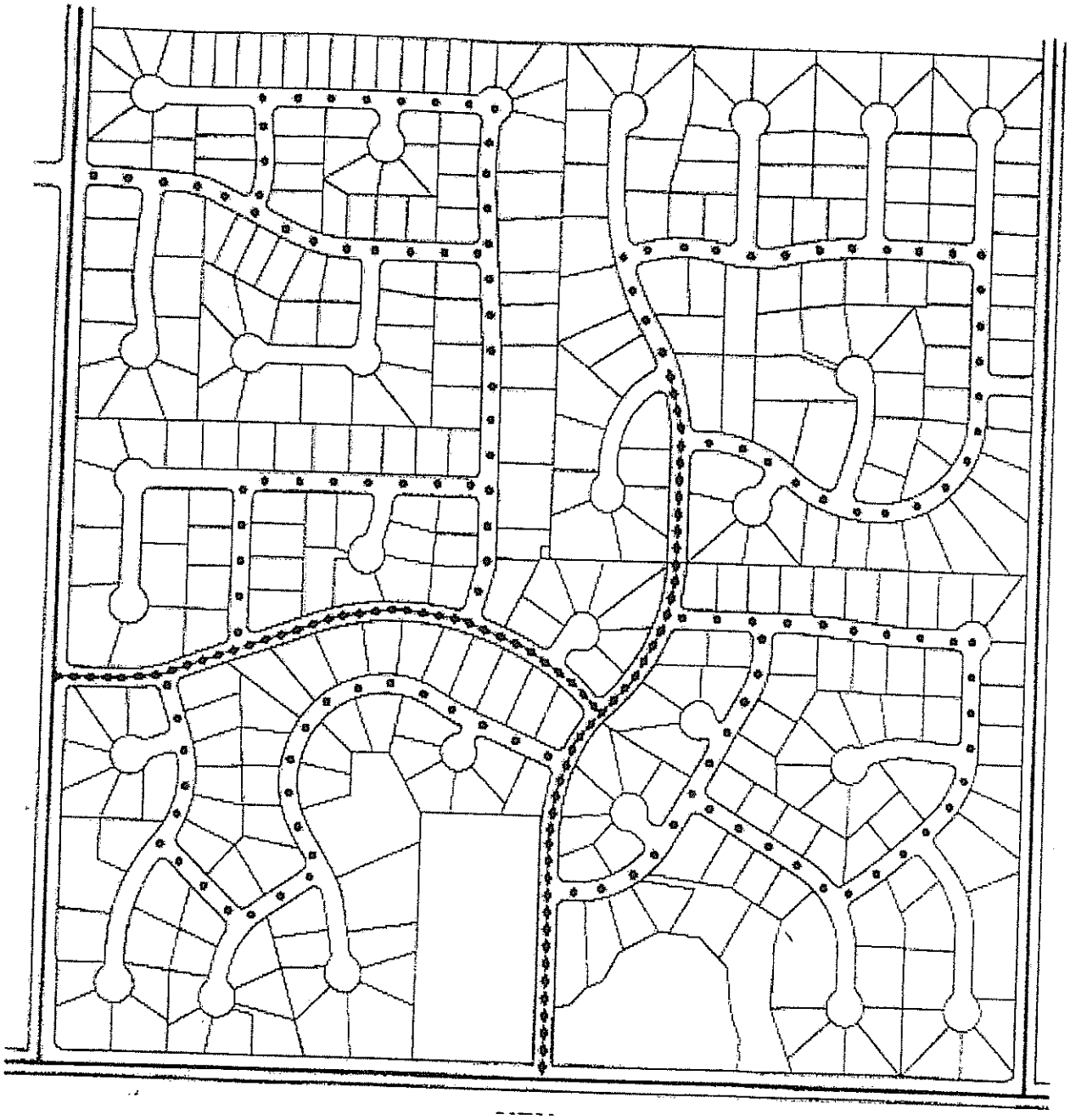
There should be a limited number of access points with the arterial roads that border the subdivision. Local roads should be designed for relatively uniform low volume of traffic upon full development, particularly for Local Road Minor and Cul-de-sacs. The system should be designed to discourage excessive speeds and should minimize the necessity for traffic control devices. Internal roads with direct lot access should be discontinuous so as to discourage through traffic.

A. A Local Road Feeder serves as primary access to the development from the adjacent street system. It distributes traffic from the Local Road Minor in residential neighborhoods and channels it to the arterial system. There

are usually no bus routes, with the exception of possible school buses. There is no direct lot access from local road feeders. It directly serves any major traffic generators within the neighborhood, such as an elementary school or a church. It usually serves one moderate size neighborhood or a combination of a few small developments, rather than interconnecting two or more larger neighborhoods. It serves little, if any, through traffic generated outside the neighborhood. Typical ADT may range from about 400 to 1,500 vehicles per day. Abutting residences are oriented away from the feeder road.

B. A Local Road Minor provides direct access from abutting land to the Local Road Feeder. There are usually no bus routes on local road minors. They are typically an internal subdivision road providing circulation within the subdivision or between subdivisions. Service to through-traffic is deliberately discouraged. A Local Road Minor is designed so that it can never become a higher classification roadway. Typical ADT may range from about 300 to 1,000 vehicles per day.

C. A Local Road Cul-de-sac is an internal subdivision road with a single outlet. It is less than 700 feet in total length as measured along the roadway centerline from the center of the cul-de-sac to the nearest right-of-way line extension of the first intersection, excluding "L" intersections. Direct lot access is provided from the stem and the bulb. It serves less than 21 residences and has a typical ADT of 200 vehicles per day or less. A Local Road Cul-de-sac is designed so that it can never become a through road or a road of a higher classification.



KEY

Arterial
Local Road Feeder
Local Road Minor
remaining roads are local road cul de sacs

Figure 2-1

Public Works Department

Road Standards v.2004

Adopted: February 23rd, 2004

Ordinance No. 0-04-261

Effective: March 7th, 2004

Purpose

The City of Maple Valley has adopted these road design criteria primarily to set forth specific, consistent road design elements for developers and other private parties constructing or modifying road or right-of-way facilities which require city licenses or permits.

In addition, these Standards are intended to support the City's goals for achieving affordable housing, providing adequate facilities for development in an efficient manner, complying with storm water management and sensitive area policies and to balance these goals with the general safety and mobility needs of the traveling public.

In adopting these Road Standards, the City has sought to encourage standardization of road design elements where necessary for consistency and to assure so far as possible that motoring, bicycling, equestrian, and pedestrian public safety needs are met. Considerations include safety, convenience, pleasant appearance, proper drainage, and economical maintenance. The Standards also provide requirements for the location and installation of utilities within the right-of-way. The City's permitting and licensing activities require the adoption of specific, identifiable standards to guide private individuals and entities in the administrative process of procuring the necessary City approval. Yet, the City must have flexibility to carry out its general duty to provide streets, roads, and highways for the diverse and changing needs of the traveling public. Accordingly, these Standards are not intended to represent the legal standard by which the City's duty to the traveling public is to be measured.

These Standards cannot provide for all situations. They are intended to assist but not to substitute for competent work by design professionals. It is expected that land surveyors, engineers, and architects will bring to each project the best of skills from their respective disciplines. These Standards are also not intended to limit unreasonably any innovative or creative effort, which could result in better quality, better cost savings, or both. Any proposed departure from the Standards will be judged, however, on the likelihood that such variance will produce a comparable result, in every way adequate to the road user and City resident.

SECTION 3-000 CURB & DRIVEWAY

Drawing Number	Drawing Title
MV-3-001	Curb and Sidewalk Joints
MV-3-002	Curb Details
MV-3-003	Curb and Gutter Section Driveway
MV-3-004	Reverse Slope Driveway
MV-3-005	Location and Width of New Driveways
MV-3-006	Joint Use Driveway Tract

SECTION 4-000 SIDEWALKS & CURB RAMPS

Drawing Number	Drawing Title
MV-4-001	Curb Ramp Locations
MV-4-002	Curb Ramps in Vertical Curb
MV-4-003	Cement Concrete Sidewalk Transition to Asphalt Shoulder

SECTION 5-000 ROADSIDE APPURTENANCES

Drawing Number	Drawing Title
MV-5-001	Clearance of Roadside Obstacles on Shoulder Type Road
V-5-002	Intersection Landing
MV-5-003	Barricades
MV-5-004	Rock Facing, Cut Section
MV-5-005	Rock Facing, Fill Section
MV-5-006	Rock Facing Under Sidewalk
MV-5-007	Rock Facing, Fill Section Reinforcement
MV-5-008	Concrete Steps and Metal Handrail
MV-5-009	Street Tree Standards
MV-5-010	Neighborhood Delivery & Collection Box Unit (N.D.C.B.U.) Mailbox Installation
MV-5-011	Bollards
MV-5-012	Roadway Survey Monument with Case and Cover
MV-5-013	Standard Double Arm Street Light Pole

CHAPTER 2. ROAD TYPES & GEOMETRICS

2.01 Road Classifications.

A. City roads are classified functionally as indicated in Sections 2.02 and 2.03. Function is the controlling element for classification and shall govern right-of-way, road width and road geometrics. Other given elements such as access, arterial spacing and average daily traffic count (ADT) are typical.

2.02 Arterial and Collector Roads. [1] Comprising the city primary road system, see Drawings No. MV-1-001 and MV-1-004.

CLASSIFICATION		PRINCIPAL ARTERIAL	MINOR ARTERIAL	BOULEVARD COLLECTOR	NEIGHBORHOOD COLLECTOR
FUNCTION		Inter-community streets connecting largest community centers & facilities	Intra-community streets connecting community centers & facilities	Intra-community street with landscaped median connecting residential neighborhoods with centers & facilities	Intra-community streets connecting residential neighborhoods with centers & facilities
Access		Controlled w/ very restricted access to abutting properties	Partially controlled with infrequent access to abutting properties	Partially controlled with infrequent access to abutting properties	Partially controlled with infrequent access to abutting properties
Typical Spacing		2 to 5 Miles	Under 2 Miles	Under 2 Miles	Under 2 Miles
Average Daily Traffic		Over 2000	Over 2000	Under 2000	Under 2000
CRITERIA					
A. Typical Road Type		Curb	Curb	Curb	Curb
B. Design Speed [2] (MPH)		Varies 40 - 60	Varies 40 - 50	Varies 35 - 45	Varies 35 - 40
C. Standard Superelevation (Ft./Ft.)		0.06	0.06	0.06	0.06
D. Horizontal Curvature		See Table 2.1, Section 2.04	See Table 2.1, Section 2.04	See Table 2.1, Section 2.04	See Table 2.1, Section 2.04
E. Maximum Grade (%) [3]		9	10	10	10
F. Standard Stopping Sight Distance (Ft.) [4]		See Table 2.1, Section 2.04	See Table 2.1, Section 2.04	See Table 2.1, Section 2.04	See Table 2.1, Section 2.04
G. Standard Entering Sight Distance (Ft.) [5]		See Table 2.1, Section 2.04	See Table 2.1, Section 2.04	See Table 2.1, Section 2.04	See Table 2.1, Section 2.04
H. Minimum Passing Sight Distance on 2-Lane Road (Ft.)		See Table 2.1, Section 2.04	See Table 2.1, Section 2.04	See Table 2.1, Section 2.04	See Table 2.1, Section 2.04
I. Minimum Traveled Way (Ft.) [6]	2/3-Lane	N/A	32	32	28
	5-Lane	56	NA	NA	NA
J. Minimum Roadway Width (Ft.) [6]	2/3-Lane	NA	44	39	28
	5-Lane	68	NA	NA	NA
K. Minimum Right-of-Way Width (Ft.)	2/3-Lane	NA	74	60	50
	5-Lane	104	NA	NA	NA
L. Type of Curb		Vertical Curb & Gutter	Vertical Curb & Gutter	Vertical Curb & Gutter	Vertical Curb & Gutter

M. NOTES:

1. Within the above parameters, geometric design requirements shall be determined for specific roads. (See Section 1.05.)
2. Design speed is a basis for determining geometric elements and does not imply posted or legally permissible speed. Curves shall be designed within parameters of B, C, and D above. (See Section 2.04.)
3. Maximum grade may be exceeded for short distances. (See Section 2.10.)

4. Standard Stopping Sight Distance (SSD) shall apply unless otherwise approved by the public Works Director. (See Section 2.11.)
5. Standard Entering Sight Distance (ESD) shall apply at intersections and driveways unless otherwise approved by the Public Works Director. (See Section 2.12.)
6. Criteria for state and federal funding may require greater width.
7. Neighborhood collectors intersecting with arterials shall be 36 feet wide for the first 150 feet. See Section 4.05 for tapers.

2.03 Business and Local Access Roads. See Drawing Nos. MV-1-005 through MV-1-007

LOCAL ACCESS STREETS			
CLASSIFICATION	BUSINESS ACCESS	NEIGHBORHOOD ACCESS	CUL-DE-SAC
FUNCTION	Local street abutting business, service, office and professional activities.	Streets providing circulation within neighborhoods typically connecting to neighborhood collectors.	Permanent cul-de-sacs, or short loops [2], connecting to neighborhood access streets and not supportive of through traffic.
Access	As needed with some restrictions	As needed with some restrictions.	As needed with only minimal restrictions.
Serving Potential Number of Single-Family Dwelling Units [8]	N/A	100 Max. [3]	50 Max.
CRITERIA			
A. Typical Road Type	Curb	Curb	Curb
B.Design Speed [4](MPH)	35	25	Low Speed Curve See Sec. 2.9
C.Max. Superelevation (Ft./Ft.)	0.06	See Sec. 2.04B	See Sec. 2.04B
D.Horizontal Curvature Min. Radius (Ft.)	Table 2.1, Section 2.04	See Table 2.2, Section 2.04	Low Speed Curve See Sec. 2.9
E.Max. Grade [5]	10	12	12
F.Standard Stopping SightDistance (Ft.) [7]	Table 2.1, Section 2.04	See Table 2.2, Section 2.04	150 ft.
G.Standard Entering SightDistance (Ft.) [7]	See Section 2.12	See Section 2.12	See Section 2.12
H.Min. Pavement Width (Ft.)	32	24	24
I.Min. Roadway Width (Ft.)	32	24	24
J.Min. Right-of-Way Width Total (Ft.)	54	45	50 Bulb
K.Min. Half St. Paved Width (Ft.)	See Section 2.06	See Section 2.06	N/A
L.Min. One-Way Paved Width Total (Ft.)	22	16	N/A
M. Type of Curb	Vertical Curb & Gutter	Vertical Curb & Gutter	Vertical Curb & Gutter

1. Within the above parameters, geometric design for specific streets shall be consistent with AASHTO Policy on Geometric Design of Highways and Streets.
2. See Section 2.13 for one-way loops.
3. See Section 2.17 for residential access connection requirements
4. Design speed is a basis for determining geometric elements and does not imply posted or legally permissible speed. Curves shall be designed within parameters of B, C & D above.(See Sect. 2.05)
5. Maximum grade may be exceeded for short distances. (See Section 2.10)
6. Standard Stopping Sight Distance (SSD) shall apply unless otherwise approved by the Public Works Director. (See Section 2.11)
7. Standard Entering Sight Distance (ESD) shall apply at intersections and driveways on neighborhood collectors unless otherwise approved by the Public Works director (See Section 2.12)
8. Maximum number of dwelling units being served by the street may be reduced by the Public Works director to a number necessary for traffic safety if the street or streets connecting the proposed street to an arterial street do not meet minimum pavement widths.

7. Meaning of terms. The definition of works and phrases as contained in PMC 12.08 are incorporated by reference.

B. Functional Classifications and Standards

1. The Washington State Department of Transportation has classified the following Arterials and Urban Collectors:

a. Principal Arterials: SR 305, Viking Avenue, SR 307

b. Minor Arterials: Finn Hill, Lindvig Way, Bond Road (to SR 305), Front Street, Fjord Drive, Hostmark Street (to SR 305), Lincoln Road (SR 305 to city limits)

c. Urban Collectors: Hostmark Street (from SR 305 to Noll Road), Liberty Way(7th Street to SR 305), Iverson Street/ 7th Avenue (Jensen Way to Liberty Way), 6th Avenue (Fjord Drive to Hostmark Street), 8th Avenue (7th Street to Lincoln Road), Lincoln Road (SR 305 to 4th Avenue/Fjord Drive).

Designs for these arterials and urban collectors will be determined by the city Engineer during design for upgrades, rehabilitations or extensions, subject to resources and constraints.

2. *Local Access Streets* classify the remainder of the city's streets. The following functional classifications are set forth for the city's local access roads:

a. Neighborhood Collectors: Neighborhood Collectors are intra-community streets which connect residential neighborhoods with centers and facilities. Examples of Neighborhood Collectors are Caldart Avenue, Mesford Road, Noll Road, Pugh Road, Forest Rock Lane.

b. Residential Collectors: Residential Collectors are streets which connect residential neighborhoods with one another and typically connect to Neighborhood Collectors. Examples of Residential Collectors are Gustaf Street, 12th Avenue, 11th Avenue, Torval Canyon Road.

c. Residential Access: Residential Access streets provide circulation within neighborhoods or subdivisions, typically connecting to Residential Collectors. Examples of Residential Access streets are Vaughn Milton, Stavanger Place, Lena Place, Norrland Court, Karl Place.

d. Commercial Collectors: Commercial Collectors are streets abutting business, service, office and professional activities. Examples of Commercial Collectors are 10th Avenue, 7th Avenue, A Street (Olhava).

e. Commercial Access: Commercial Access streets can be public or private, and provide interior access to commercial centers. Examples of commercial access streets are Powder Hill Road, Poulsbo Village access, Olhava access streets. The minimum standards for street construction shall be as shown in the table below.

2. Connectivity. The policy of the city is to connect adjacent neighborhoods to one another to the extent safe and practical. The purpose is to provide safe, redundant and efficient access and egress to both residents and emergency and safety equipment. Developers shall propose connections from plats to adjoining undeveloped land and right of way shall be dedicated for these connecting streets in the plat.

3. Local Access Streets.

Local access streets are those streets within the City that provide access between residences, business and other destinations with the arterial and state highway system network. Dimensions of streets are based on safety requirements and engineering standards widely in use in the United States that have proven safe and practical. The driving constraint on street dimensions is the requirement to maintain 20 feet of clear space, at all times, for access by fire apparatus.

The following table establishes the dimensions and standards for local access streets.

LOCAL ACCESS STREETS					
Design Standard	Neighborhood Collector (Note 1)	Residential Collector	Residential Access	Commercial Collector	Commercial Access
Figure	2-04	2-05	2-02 / 2-03	2-06	
ROW width	50'	50'	40'/45' (Note 3)	50'/60' (Note 4)	As required
Pavement width	30'	30'	28'	30'/42' (Note 5)	24'
Recommended ADT (Note 2)	>1,000	<1,000	<250	1000-4000	50-1000
Sidewalk	5' both sides	5' both sides	5' one side; *both as required by City Engineer	5' both sides	As required
Lane width	12'	11'	10'	12'	12'
Paved Shoulder	3'	none	none	3'	none
Connectivity	Yes	Yes	No	Yes	No
Design Speed	25	25	25	25	25
Maximum Grades	12%	12%	12%	12%	12%
Curb Radii	35'	35'	25'	35'	35'
On-street parking	No unless 8' bulb outs provided	8' One side	8' One side	No unless 8' bulb outs provided	No unless 8' bulb outs provided

Figure 2-1. Local Access Streets

Notes:

1. Should appear on City Comp. Transportation Plan.
2. Volumes based on 9.55 Average Daily Trips (ADT) per Residential Unit.
3. Right-of-Way shall be 45' if sidewalks required on both sides.
4. 50' Right-of Way for two lanes, 6' for three lanes.
5. 30' Paved width for two lanes, 42' paved width for 3 lanes.

3. The center of residential cul-de-sacs will unobstructed except that those areas may be proposed to be integrated with storm drainage systems such as pervious pavement infiltration areas or rain gardens. These areas shall not be used for storm water detention areas.

4. Pavement shall be constructed of either Portland Cement Concrete (PCC) or Asphalt Concrete (AC), depths and sections of which shall be designed to meet appropriate repetitions of loads and sub-base soil bearing capacity, or minimum depths and sections as shown Section N 7. following.

5. Streets shall be constructed and graded to full right-of-way widths and surfaced with asphalt concrete or Portland Cement Concrete to the widths specified in Section A.2 above. Curbs shall be Portland Cement Concrete. Rolled curbs are not permitted.

6. The location and alignment and names of streets shall conform to existing streets and the Comprehensive Street Plan except where, in the opinion of the City Engineer, topography or some physical feature eliminates the possibility of connecting these streets in the future. Developers shall submit proposed street names to the City Engineer for approval subject to approval also by Kitsap County Central Communications (CENCOM).

7. Streets and lots shall be placed in relationship to natural topography so that grading and filling and/or other alterations of existing conditions is minimized. Reserve strips or street plugs controlling access to streets will not be approved unless, in the judgment of the City Engineer, they are required for the protection of the public welfare or substantial property rights. In such cases, reserve strips or street plugs will be required. The control and disposal of the land comprising such strips or plugs shall be placed within the jurisdiction of the City.

8. If, in the opinion of the City Engineer, it is necessary to give access to or permit future subdivision of adjoining land, streets and utilities shall be extended to the boundary of the subdivision and the resulting dead-end street shall be provided with a temporary cul-de-sac or Hammerhead turnaround (Figures 2-10 and 2-13). Streets that dead-end which are longer than 150' shall be terminated in a cul-de-sac.

9. Half streets shall be prohibited except where, in the opinion of the City Engineer, such are essential to development in conformity with the other requirements of this ordinance. A cul-de-sac shall be constructed when the street length is greater than 150 feet or when 6 or more residences are accessed from that street. When the road is extended in the future to serve the adjacent parcels, property owners abutting the temporary cul-de-sac may petition the City Council for vacation of the portion of the right-of-way which is beyond the necessary right-of-way of the new road extension. If the vacation is granted, the abutting property owners will be responsible for the removal of pavement and sidewalks in the vacated area and reconstruction of the sidewalks in the revised right-of-way. The abutting property owners shall grant easements to the proper grantees for any utilities located within the vacated area. The abutting property owners shall be responsible for all construction costs, including engineering and surveying, and shall obtain all necessary permits from the City.

10. The street system (in residential subdivisions) shall be laid out with a minimum number of intersections with arterial streets. Arterial streets shall not intersect with other arterial streets at intervals closer than 1,320 feet. No streets shall intersect at intervals closer than 125 feet unless, in the judgment of the City Engineer, an exception to this rule would be in the public interest and welfare.

11. Street intersections shall be laid-out so as to intersect as nearly as possible at right angles. Under no circumstances shall any street intersect with any other street at an angle of less than 60 degrees.

12. Private streets shall serve four (4) or less residences. All-weather surfacing (gravel base without paved surfacing) is permissible on private streets with less than six (6) per cent grade. Asphalt concrete thickened edges may be permissible on private streets with the approval of the City Engineer. See Figure 2-12.

13. Pavement markings shall be in accordance with the "Manual on Uniform Traffic Control Devices" published by the US Department of Transportation.

14. All street ends with the possibility of extension must have utilities stubbed out of the paved area a minimum of six (6) feet or as directed by the City Engineer.

15. All-weather surfaces shall be constructed with a minimum 6 inches, compacted depth, gravel base, and a minimum of 2 inches, compacted depth crushed surfacing top course.

C. Driveways

Driveways shall conform with WSDOT standard specifications and drawing details as shown in WSDOT Standard plan F-4, available on line at: http://www.wsdot.wa.gov/EESC/Design/designstandards/HTM/F4.htm with exceptions as noted below.

1. Location

a. No driveway shall be located so as to create a hazard to pedestrians, bicyclists, or motorists, or invite or compel illegal or unsafe traffic movements.

b. No driveway shall be constructed in such a manner as to be a hazard to any existing street lighting standard, utility pole, traffic regulating device or fire hydrant. The relocation of any street structure shall be allowed only upon the approval of the agency owning the structure involved and the City Engineer.

c. Residential lots shall not access onto highways, arterial streets, business districts, neighborhood collectors or industrial areas unless approved by the City Engineer.

e. Exposed aggregate driveway approaches are not allowed.

2. Size and Number.
a. Except as otherwise provided, the width of any residential driveway's access to the public right-of-way shall not be less than 10 feet or greater than twenty (20) feet (exclusive of the radii of the returns). The minimum width for any commercial driveway shall be not less than 24 feet and not greater than 30 feet unless approved by the City Engineer. The City may authorize more than one residential driveway access or residential driveway widths greater than twenty (20) feet for three-car garages, for access driveways necessary for off-street parking, recreational vehicle parking or in order to ensure save egress to the public right-of-way.

b. The total width of all driveways for any one ownership on a street shall not exceed *50%* of that ownership along the street. Any driveway which has become abandoned or unused through a change of the conditions for which it was originally intended, or which, for any other reason, has become unnecessary, shall be closed. The owner, when directed by the City Engineer, shall replace any such driveway curb cut with a standard curb and sidewalks as described in this guide.

c. There shall not be more than two driveways on one street for any one ownership except where a single ownership is developed into more than one unit of operation. In such cases the proponent shall submit the proposed driveway configuration to the City for approval.

d. Unless otherwise approved by the City, all driveways, including the returns, shall be confined within lines perpendicular to the curb line and passing through the property corners. Driveways shall be located no closer than the distances from an intersecting street based on the street type on which the driveway connects as shown below, unless a waiver is is granted by the City Engineer:
:

Street Type Abutting Driveway	**Minimum Distance from Street Intersection (feet)**
Neighborhood Collector	75'
Residential Collector	50'
Residential Access	30'
Commercial Collector	
Commercial Access	

3. Driveway Slopes

a. Driveway slopes shall not exceed 15% unless authorized by the City Engineer as set forth below.

b. The City Engineer may authorize driveway slopes to exceed 15%, up to a maximum of 20%, if it is determined that:

(1) The driveway is the only economically and environmentally reasonable alternative,
(2) The driveway will not present a traffic, pedestrian, bicycle, or safety hazard,
(3) The Fire Chief concurs in allowing the increased driveway slope, and,
(4) The public health, safety, and general welfare will not be adversely affected.

4 Driveway Angle.
a. The angle between any single family residential driveway and the street roadway or curb line shall not be less than 60 degrees.
b. Commercial Driveways shall be perpendicular to the street.

5 Driveway Transition

a. A vertical transition is necessary on driveways to allow adequate clearance for long overhang vehicles such as recreational vehicles, delivery and garbage trucks.

b. A transition shall be constructed whenever the algebraic difference in grade exceeds 6%. This transition shall be constructed in accordance with Standard Detail Figure 2-14, Driveway Transition of these Construction Standards and Specifications.

6. Shared Driveways
Shared driveways shall serve 4 or less residences. The driveway shall be 20 feet wide and be paved onto the property for a minimum of 20 feet from the right-of-way. An all-weather surface is acceptable for the remainder of the driveway. If the property can be further subdivided, provision must be made for the future right-of-way and city street via increased building setbacks, lot layout, or other means which will provide for the future right-of-way.

D. Private Streets
Private streets are allowed for commercial or industrial sites or residential developments under one ownership, such as apartments and condominiums. Private streets are not allowed in short plats, longs plats, planned unit developments (unless the planned unit development is a condominium), or binding site plans. The lane width and sidewalk requirements for public streets shall apply to private streets. On-street parking is optional and requires an additional 8 feet of street width. The minimum fire lane width must be maintained at all times.

E. One-Way Streets One-way streets shall include a driving lane width of 20 feet and a parking lane width of 8 feet. Parking is required on one side. Sidewalks shall be required per Figure 2-1, Standards for Local Access Streets. The right-of-way width

shall be 40 feet when sidewalks are required on one side and 45 feet when sidewalks are required on both sides.

F. Street Ends

1. Vehicle turnaround facilities required by PMC 12.08 shall be provided in accordance with this section and Figure 2-10, Cul-de-Sac, or 2-13, Turnaround (Hammerheads).

2. A hammerhead per Figure 2-13 may be used to fulfill the requirement to provide turnaround facility where the street serves (or will serve), nine or fewer residences.

3. A circular turnaround (Cul-de-Sac) per Figure 2-10, shall be provided for streets that serve (or will serve) ten or more residences.

4. Alternative street end designs may be allowed subject to the review and approval by the City Engineer and Fire Marshal.

5. The maximum cross grade of a street at the street end shall be 8%.

G. Sidewalks, Curbs and Gutters

Sidewalks, curbs and gutters shall conform to WSDOT specifications and Drawings section F, found on-line at: http://www.wsdot.wa.gov/eesc/design/designstandards/HTM/TOC.htm except as noted below.

1. Sidewalks shall be constructed in such a manner as to make provision for the installation of mailboxes, with clustered mailboxes to be provided wherever possible. The Postmaster shall be consulted as to location and other requirements. See figure 2-35.

2. All sidewalks shall meet the requirements of the Americans with Disabilities Act for access ramps.

3. When sidewalk installation is required, all storm drainage, curbs, gutters, street pre-level and/or fill required to match the street to the sidewalk and asphalt surfacing shall be installed from the existing paved edge to the new gutter along the full length of the project. All costs for installation shall be borne by the developer.

4. Rolled curb and gutters are not permitted.

5. The standard sidewalk width shall be 5' (note: WSDOT standard drawings generally show 6').

H. Reserved

I. Wheelchair Curb Ramps
Access to sidewalks and public facilities shall comply with the Americans with Disabilities Act. Ramps shall be constructed per WSDOT specifications and drawings found in Section F of the Standard Plans on-line at: http://www.wsdot.wa.gov/eesc/design/designstandards/HTM/TOC.htm.

J. Mailboxes
Mailboxes shall be installed in public rights of way as shown in Figure 2-35. Mailbox installation shall meet the requirements established by the Postmaster, Poulsbo, Washington.

K. Channelization, Signing and Traffic Signals
Traffic signals, signage and channelization shall follow the Manual on Uniform Traffic Devices.

L. Street Lighting
1. Street lighting shall comply with IES standards for the street standard for which designed.

M Construction Pre-construction conference.
Prior to the start of construction, a pre-construction conference shall be held to review construction plans, specifications, and schedules. As a minimum, the conference shall be attended by the following:

1. The developer or his representative
2. The developer's engineer
3. The general contractor
4. The City Engineer, Public Works Director, and Engineering Inspector, or their designated representatives.
5. Representatives of other utilities or agencies that may be affected by the construction.

N. Street Specifications, General Construction, Equipment and Materials

1. General. The work to be performed shall be done in accordance with this Guide and the Standard Specifications for Road, Bridge and Municipal Construction, (WSDOT and APWA Most Recent Additions) and Standard Plans for Road, Bridged and Municipal Construction, (WSDOT and APWA, Most Recent Addition) except as modified in this Guide. All work is to be done in strict accordance with the specifications and applicable plans. These documents are available at the Engineering Department, Public Works, City of Poulsbo, and on-line at:

http://www.wsdot.wa.gov/eesc/design/designstandards/HTM/TOC.htm (Standard Plans), and,

http://www.wsdot.wa.gov/fasc/EngineeringPublications/Manuals/SS2004.PDF (Standard Specifications)

2. Clearing and Grubbing. The work performed shall be done in accordance with Division 2 of the Standard Specifications. The clearing limits shall be to the right-of-way margins unless shown otherwise on the approved construction drawings.

3. Survey. All utilities and roads shall be staked for construction by the developer's engineer. The contractor is responsible for the installation of sidewalks and streets to the correct grade and alignment.

4. Excavation and Embankment. Roadway excavation and embankment construction shall be performed in accordance with Division 2 of the Standard Specifications. Compaction shall be by Method B.

5. Bank Run Gravel. Bank run gravel (gravel base) shall conform to Division 4 of the Standard Specifications.

6. Crushed Surfacing. Crushed surfacing shall conform to Division 4 of the Standard Specifications.

7. Asphalt Concrete Pavement. Asphalt concrete pavement shall conform to Division 5 of the Standard Specifications. Superpave asphalt concrete shall be used unless use of an alternate class is approved by the City Engineer. Asphalt Concrete Pavement sections shall be either by design for anticipated traffic (loading repetitions) or the following minimum standard sections:

Classification	Asphalt - Top Course – Gravel Base (inches)
Arterial	4 - 4 - 6
Commercial Access/Collector	4 - 4 - 6
Neighborhood Collector	4 - 4 - 6
Residential Collector	3 - 4 - 6
Residential Access & all other residential categories	3 - 4 - 6

(a). Top Course and Gravel Base shall extend to the back of the sidewalk for all pavement classifications.
(b). Asphalt shall be places in two lifts. Tack coat shall be placed between lifts.
(3) Tack coat shall be placed on the face of all gutters or other adjoining edges.

8. Cement Concrete Sidewalks and curbs and gutters. Cement concrete sidewalk shall conform to this Guide, and the standard drawings found in Section F, Drawing

F-1, WSDOT Standard Plans and Section 1 of this guide. Driveway sections of sidewalks shall be not less than six-inches (6-inches) in depth Portland Cement Concrete (PCC) and shall be reinforced with 6" x 6" x 10-gauge steel wire mesh.

9. Reserved.

10. Erosion Control. Erosion control shall be performed in accordance with Division 8 of the Standard Specifications and the approved Special Provision for the project.

11. Monuments. Monuments shall be furnished and installed in accordance with Division 8 of the Standard Specifications. Also see figures 2-16 to 2-18.

12. Backfill adjacent to sidewalks and curbs. The contractor shall place and compact backfill material against sidewalks and curbs immediately upon removal of the forms.

13. Street Signs, Street signs shall comply with the provisions of the MUTCD and section 1, General, of this manual.

14. Barricades. Permanent barricades shall be installed as directed by the City Engineer. Barricades shall be constructed, erected, painted, and signed in accordance with the MUTCD.

15. Covers in Paved Right of Ways. Water valve boxes, cleanouts, and manhole covers shall be flush with final street grade.

O. Standard Details Figures

List of Figures
Streets - Section 2

Figure	Title
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WSDOT	Cement Concrete Sidewalk (w/Poulsbo modifications)
WSDOT	Sidewalk Ramp *(w/Poulsbo modifications)* Type 1A,1B, 1C, & 1D
WSDOT	Sidewalk Ramp *(w/Poulsbo modifications)* Type 2A & 2B
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2- 38	*Reserved*
2- 39	*Reserved*
2- 40	*Reserved*

P. References and Exceptions:

1. Portland Cement Concrete Driveway Entrance Types 1, 2, 3, and 4:
Use WSDOT Standard Plan F-4, which can be found at:
http://www.wsdot.wa.gov/eesc/design/designstandards/HTM/toc.htm

Exception to Standard Plan: WSDOT plan shows sidewalks 6' in width. Sidewalks may be constructed 5' in width.

2. Sidewalks and sidewalk ramps:
Use WSDOT Standard Plans F3a, b, c, d and e, with the following exceptions:
Dummy joints shall be 5' on-center,
Expansion joints shall be 15' on-center.

LOCAL ACCESS STREETS					
Design Standard	Neighborhood Collector (Note 1)	Residential Collector	Residential Access	Commercial Collector	Commercial Access
Figure	2-04	2-05	2-02 / 2-03	2-06	
ROW width	50'	50'	40'/45' (Note 3)	50'/60' (Note 4)	As required
Pavement width	30'	30'	28'	30'/42' (Note 5)	24'
Recommended ADT (Note 2)	>1,000	<1,000	<250	1000-4000	50-1000
Sidewalk	5' both sides	5' both sides	5' one side; *both as required by City Engineer	5' both sides	As required
Lane width	12'	11'	10'	12'	12'
Paved Shoulder	3'	none	none	3'	none
Connectivity	Yes	Yes	No	Yes	No
Design Speed	25	25	25	25	25
Maximum Grades	12%	12%	12%	12%	12%
Curb Radii	35'	35'	25'	35'	35'
On-street parking	No unless 8' bulb outs provided	8' One side	8' One side	No unless 8' bulb outs provided	No unless 8' bulb outs provided

Notes:
1. Should appear on City Comp. Transportation Plan.
2. Volumes based on 9.55 Average Daily Trips (ADT) per Residential Unit.
3. Right-of-Way shall be 45' if sidewalks required on both sides.
4. 50' Right-of Way for two lanes, 6' for three lanes.
5. 30' Paved width for two lanes, 42' paved width for 3 lanes.

Revised: JAL-9/20/2005 File: 2-01_Table-R2005-09-20.pub

City of Poulsbo Department of Public Works	Street Standards	
REVISED BY: JAL DATE: 9/20/2005	APPROVED BY: JAL DATE: 9/20/2005	Fig. 2-01 Ref:

J

Kelso Street Fund Budget History 2000-2007

CITY STREET FUND

2007 FINAL BUDGET

FUND: 101 DEPT: 16

BASUB	ELE	OBJ	ACCOUNT DESCRIPTION	
542	30	100	**SALARIES** *Pays salaries for 2.34 full-time equivalent positions.*	$ 100,000
542	30	110	**STREET PART-TIME HELP**	4,000
542	30	120	**OVERTIME**	4,500
542	30	200	**BENEFITS** *Health, Dental/Vision, DRS, FICA, Worker's Comp., Etc.*	37,700
542	30	311	**SUPPLIES** *Crushed surfacing base course & top course, asphalt & misc supplies.*	35,000
542	30	312	**SURFACE MAINTENANCE PROGRAM** *Various resurfacing of roads throughout the City.*	50,000
542	30	320	**FUEL - VEHICLES**	8,700
542	30	350	**SMALL TOOLS/EQUIPMENT** *Miscellaneous small tools.*	2,500
542	30	420	**TELEPHONE/POSTAGE** *FAX, telephone and postage.*	700
542	30	430	**TRAVEL/TRAINING** *Various courses and seminars.*	750
542	30	470	**STREET LIGHTS - POWER & MAINTENANCE**	80,000
542	30	480	**REPAIR AND MAINTENANCE** *Fences and guardrails.*	5,000
542	30	481	**STREET SWEEPING** *Contract street sweeping.*	5,000
542	30	482	**SIDEWALK REPLACEMENT** *Wheelchair ramp and sidewalk program funding.*	9,500
542	30	483	**VEHICLE MAINTENANCE**	20,000
542	30	490	**MISCELLANEOUS EXPENSE** *Rain gear/laundry/dues, memberships and rental of parking lot on Grade Street.*	5,700
542	30	491	**EQUIPMENT RENTAL** *Asphalt planer and crack sealer.*	6,000
542	30	940	**EQUIPMENT RESERVE - DEPRECIATION** *For the future purchase of vehicles.*	49,688
542	50	480	**BRIDGE REPAIR & MAINTENANCE** *Includes bridge inspection by WSDOT, plus City maintenance of Allen St. Bridge.*	38,500
542	60	100	**TRAFFIC CONTROL SALARIES** *Pays salaries for 2 full-time equivalent positions.*	90,500
542	60	110	**OVERTIME**	2,000

CITY STREET FUND

2007 FINAL BUDGET

FUND: 101 DEPT: 16

BASUB	ELE	OBJ	ACCOUNT DESCRIPTION	
542	60	120	**PART TIME HELP**	11,000
542	60	200	**BENEFITS** *Health, Dental/Vision, DRS, FICA, Worker's Comp., Etc.*	40,600
542	60	310	**SUPPLIES**	24,185
542	60	320	**FUEL - VEHICLES**	5,000
542	60	350	**TOOLS/EQUIPMENT** *Various small tools.*	400
542	60	410	**CENTERLINE STRIPING/ROADSIDE SPRAYING**	18,000
542	60	483	**VEHICLE MAINTENANCE**	6,000
542	90	420	**TELEPHONE/POSTAGE** *FAX, telephone, cellular phones and postage.*	700
542	90	430	**TRAVEL/TRAINING** *Miscellaneous training.*	500
542	90	460	**INSURANCE**	17,300
542	90	470	**UTILITY SERVICE** *Water/sewer/electricity/garbage.*	4,900
542	90	480	**SHOP AND RADIO REPAIRS**	500
542	90	481	**HARDWARE MAINTENANCE**	1,000
542	90	482	**SOFTWARE MAINTENANCE** *Computer software maintenance for AS400.*	2,000
542	90	490	**MISCELLANEOUS EXPENSES** *Dues, subscriptions, laundry service and misc expenses.*	5,500
542	90	910	**ACCOUNTING/ATTORNEY SERVICES** *Reimburse the general fund for accounting, legal and computer services.*	23,350
542	90	940	**EQUIPMENT RESERVE - DEPRECIATION** *For the future purchase of vehicles.*	10,822
597	00	002	**TRANSFER TO 104 - PATHS AND TRAILS** *One half of 1% motor vehicle fuel tax.*	1,005

CITY STREET TOTAL EXPENDITURES	**$ 728,500**

ARTERIAL STREET FUND

2007 FINAL BUDGET

FUND: 102 DEPT: 18

BASUB	ELE	OBJ	ACCOUNT DESCRIPTION	
541	10	545	**TEN YEAR OVERLAY PROGRAM** *Various overlays throughout the City.*	$ 170,000
581	20	000	**INTERFUND LOAN PRINCIPAL - FUND 106** *Loan from Stadium fund for LID 182. Payoff 2007.*	1,907
591	45	780	**PWTF LOAN - PRINCIPAL** *PWTF loans for bridge replacement and 16th Ave slide.*	22,713
592	45	820	**INTERFUND LOAN INTEREST - FUND 106** *Loan from Stadium fund for LID 182.*	100
592	45	830	**PWTF LOAN - INTEREST** *PWTF loans for bridge replacement and 16th Ave slide.*	12,952
595	06	001	**RAILROAD CROSSING** *BNSF crossing 100% WSDOT financing.*	300,000
595	06	003	**WEST MAIN STREET REALIGNMENT** *WSDOT funded 100%.*	400,000
595	06	004	**13TH AVENUE SIDEWALK** *TIB funded 80%.*	130,097
595	06	005	**GRADE/ASH STREET HANDICAP BARRIER REMOVAL** *TIB funded 80%.*	162,681
595	06	008	**GRADE/5TH/OAK REALIGNMENT** *TIB funded 80%.*	30,000
597	00	000	**TRANSFER TO 104 - PATHS AND TRAILS**	470

ARTERIAL STREET TOTAL EXPENDITURES	**$ 1,230,920**

Budgeted Street Funds Summary			
YEAR	STREETS (101)	ARTERIAL STREET (102)	TOTAL
2000	$ 600,193.00	$ 11,645,598.00	$ 12,247,791.00
2001	$ 626,187.00	$ 547,265.00	$ 1,175,453.00
2002	$ 568,118.00	$ 3,715,909.00	$ 4,286,029.00
2003	$ 611,986.00	$ 851,778.00	$ 1,465,767.00
2004	$ 575,143.00	$ 342,899.00	$ 920,046.00
2005	$ 636,729.00	$ 338,278.00	$ 977,012.00
2006	$ 709,810.00	$ 3,422,415.00	$ 4,134,231.00
2007	$ 728,500.00	$ 1,230,920.00	$ 1,961,427.00

K

Kelso Attorney Opinion Regarding Solid Waste Fund Transfer to the Street Fund

MEMORANDUM

TO: DAVID SYPHER

FROM: Paul Brachvogel PB

Re: Solid Waste Fund Payment to Street Maintenance Fund

Date: November 5, 2004

I. Facts

The solid waste utility of the City of Kelso contracts with a private firm, Waste Control, Inc., to pick up and deliver solid waste to the Cowlitz County land fill. Utility customers are charged certain fees for this service which are, in part, accumulated and maintained in Kelso's solid waste fund intended for the ongoing support of that utility.

The garbage trucks used to serve Kelso's customers exact a unique, but considerable depreciation on City streets. The trucks are large and are capable of delivering large capacities. They are capable of becoming increasingly heavy during routine routes, as they store and compact waste. Several studies suggest that due to these facts, one garbage truck is equivalent to the average daily traffic of 830 to 1,500 automobiles. See the attached studies indicating the impact of garbage trucks on city streets.

II. Issue:

Whether the solid waste utility funds may be transferred to the street maintenance fund in order to pay for damage caused to the streets during solid waste disposal without constituting an illegal tax or a violation the Accountancy Act, RCW 43.09.210.

III. Short Answer:

The proposal does not constitute an illegal tax, nor is it in violation of the Accountancy Act.

IV. Analysis

A. The fund transfer does not amount to an illegal taxation.

In Okeson v. City of Seattle, 150 Wn.2d 540 (2003) the Supreme Court of the State of Washington addressed whether cost shifting from a utility rate payer fund to a fund supported by general government revenue constitutes an unconstitutional tax on utility customers. The Court held that downtown street lighting was a governmental function which could not be supported by an unauthorized tax on the rate payer. The court determined the increased fees paid by city light rate payers was an unauthorized tax, as opposed to lawful regulatory fee, based on the following: 1) Whether the purpose of the cost shifting was to raise revenue. 2) Whether the money raised by the shifting is for an authorized purpose and 3) Whether the fee has a sufficient relationship between the service received or burden produced.

Under the first factor, a regulatory fee raises money for the payment of the regulated activity, while a taxation raises revenue for the general public. In essence, proper regulatory fees are present if "the fee raises money to pay for . . . the service that those who pay will enjoy". Okeson, at p. 552-553. See also, Samis Land Com. V. City of Soap Lake, 143 Wn. 2d 798, 806, (2001). It is clear the utility rates are not designed to raise money for general government. The intent of those funds was clearly to sustain the utility over time. As part of this objective, it is appropriate that solid waste utility fees be used to pay the overall solid waste disposal cost, which includes payment for damage done to City infrastructure.

As to the second factor, the street maintenance operations of the City of Kelso are clearly authorized.

The Okeson court focused primarily on the third factor: Whether there was enough relationship between the fee imposed and the service rendered to those paying the fees in order to constitute a valid regulatory fee. In Okeson, there was no relationship between City Light customers' increased bills and general street lighting of downtown Seattle. This is not the case here, where there is a direct nexus between customer utility fees and the payment for damage caused as a result of delivering the utility service. In essence, the customer is paying for the utility service through the shifting of the solid waste utility funds to the street maintenance fund.

Based on the factors set forth in Okeson, the fund shifting does not amount to an unconstitutional taxation on utility customers.

B. The proposed fund shifting does not violate the Accountancy Act, RCW 43.09.210.

Because the Court found the City Light utility fees constituted an illegal taxation of Seattle City Light customers, it did not go on to address whether 43.09.210 is violated by the proposed fund shifting. RCW 43.09.210 states in pertinent part:

> Separate accounts shall be kept for each department, public improvement, undertaking, institution, and public service industry under the jurisdiction of every taxing body.
>
> All service rendered by, or property transferred from, one department, public improvement, undertaking, institution, or public service industry to another, ***shall be paid for at its true and full value by the department,*** public improvement, undertaking, institution, or public service industry receiving the same, and no department, public improvement, undertaking, institution, or public service industry shall benefit in any financial manner whatever by an appropriation or fund made for the support of another.

In State v. Grays Harbor County, 98 Wn.2d 606, 610 (1983) the Supreme Court for the State of Washington addressed whether the state should pay for the filing fees of prosecuting attorney's offices in Lewis and Grays Harbor Counties. In answering in the affirmative and interpreting the Accountancy Act, the Court stated that agencies must pay full market value for services rendered by other departments or governmental bodies unless a specific statutory exception applies. While the statute requires separate accounts be kept for each division of the Public Works Department, it does not prohibit funds transfer, provided true consideration is given up in exchange. In this case, the empirical evidence attached hereto supports the conclusion that the solid waste utility fund is receiving bona fide consideration in the form of unique and marked depreciation of City streets through the routine and repeated use of its specialized vehicles.

CONCLUSION

The transfer of funds from the solid waste utility fund to the street maintenance fund of the Public Works Department is lawful. Such a transfer does not constitute an illegal taxation or a violation of RCW 43.09.210. In fact, under RCW 43.09.210, the City would likely have a duty to transfer funds upon notice of the cost / damage attendant with garbage collection.

March 7, 2007

TG: 07032.PR

Mr. David Sypher
Public Works Director
City of Kelso
203 South Pacific, Suite 205
PO Box 819
Kelso, WA 98626

SUBJECT: SANITATION FUND – ANALYSIS OF REIMBURSEMENT FOR STREET DAMAGE

Dear David:

The Transpo Group appreciates the opportunity to assist the City of Kelso in its review of the impacts of garbage trucks on local streets. Based on our discussions, I have reviewed the Executive Summary and related exhibits provided by you.

The City has prepared a thorough analysis of damage to local streets due to heavy garbage trucks. The analysis covers the relative impacts of each loaded garbage truck in terms of the number of equivalent passenger cars. It also includes a review of the needed budget and available revenues for funding local street maintenance.

The following summarizes our review and findings:

- Overall, the analysis provides a conservative (low) approach for allocating costs from the City's Sanitation Fund to its Street Fund to help offset impacts of garbage trucks on local streets.
- The range of studies presented by the analysis shows the impact of a 60,000 gross vehicle weight garbage truck would have the equivalent impact of up to 5,100 passenger cars. Use of an equivalent impact of 1,020 passenger cars per garbage truck is at the low end of the various studies. This will result in a relatively lower level of impact than actually might result from loaded garbage trucks.
- Based on national data, local streets typically carry 400 to 1,500 vehicles per day (vpd). The City's traffic count data for a range of local streets in various neighborhoods of the City shows an average volume of less than 500 vpd. The City's methodology for assessing the impacts of garbage trucks used an average of approximately 700 vpd on local streets. This value represents the weighting of the national data with local data from Kelso. Thirteen of the 16 locations counted by the City, fall below the 700 vpd used in the calculation, which provides for a conservative estimate of the relative impacts of sanitation trucks on local streets.

- The City's analysis results in a single garbage truck representing approximately 21 percent of the axel loads on a typical local street over a one-week period. This calculation is accurate based on the range of data and the conservative assumptions used by the City.
- For budgeting purposes, the City would apply the 21 percent factor to the budgeted expenditures for the maintenance and overlays of local streets. This is an appropriate application of the factor for establishing a budget for the relative cost share.
- As noted, the City will track local road maintenance expenditures and adjust the actual transfer amount based on the values for 2007.

The analysis supports the transfer of funds from the city's Sanitation Fund to local street maintenance. The analysis is based on professional studies and analyses of local data. The studies and data illustrate that the actual impact of garbage trucks on the local street pavement would likely be more than 21 percent. However, due to the range of results documented in the studies, it is appropriate to apply the results in a conservative manner, as the City has done.

Please call me at 425.821.3665 to discuss any questions or comments. We appreciate the opportunity to assist you in this matter and look forward to working with you in the future on other transportation needs.

Sincerely,
The Transpo Group, Inc.

Larry W. Toedtli, P.E.
Principal

LWT/aml